

# Sandia microtransmission becomes a reality

**3 million:1 gear ratio achieved in sq. mm**

By Neal Singer

First there were microengines. Now researchers at Sandia have built microtransmissions.

A micromachine and its attached microtransmission easily could be overlooked among, say, grains of sand.

But the engine and its gearing theoretically can generate enough force to move a one-pound object, report researchers Steve Rodgers and Jeff Sniegowski (both 1325), who built the mighty mite.

"We believe this is by far the most force ever generated by a polysilicon micromechanical device," says Steve. "We're showing you can move significant loads and get the function you want."

## Twenty-nine tiny, intermeshing gears

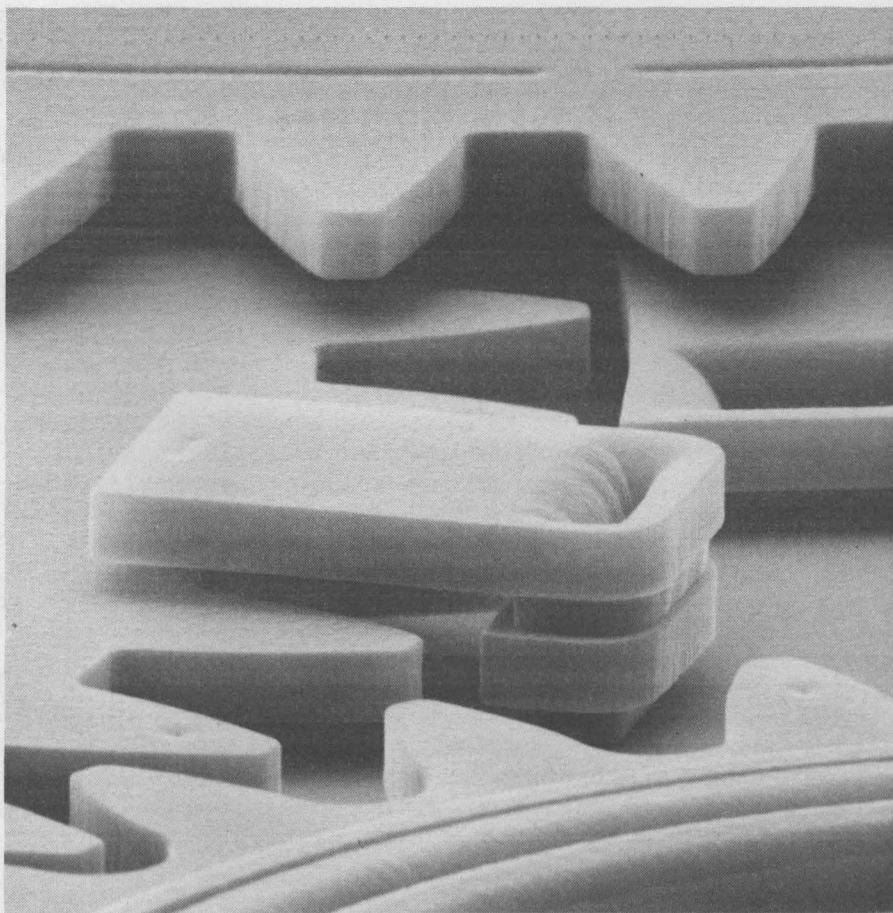
The transmission achieves a three-million-to-one gear reduction ratio in less than one square millimeter of area, through use of 29 intermeshing gears, each about the diameter of a human hair.

While Sandia is interested in the tiny machines as near-invisible locks for nuclear weapons, companies and universities that wish to utilize the modular technology for fabrication purposes will be able to download basic units of the transmission "as easy as clip art," says Steve. Having downloaded the blueprint for the gears, a company can design as few or as many intermeshing transmission systems as needed, and do so cheaply and easily.

The Sandia microtransmission comprises six identical transmission systems, each with two dual-level gears. The two gears, crafted one atop the other, operate at ratios of 3:1 and 4:1, which together form a 12:1 gear reduction ratio. A coupling gear allows more gear sets to be added modularly.

The robust machines may be effective in satellites, where payload weight

*(Continued on page 4)*



CLOSEUP VIEW of Sandia's 3 million:1 ratio transmission. The distance across the photo equals about one-third the width of a human hair. It shows guides that prevent warping as conditions change. Sandia is interested in the tiny machines as near-invisible locks for nuclear weapons. They may also be useful in satellite communications, sensors, optical telescopes, and optical switching for telephone lines.

## Games? Hardly. Combat simulator helps NATO group test base security

By Bill Murphy

It's not exactly the celebrated Star Trek holodeck, but it's pretty darned realistic. That's what participants in a NATO exercise discovered this month at Sandia using Joint Tactical Simulation (JTS) software to evaluate NATO base security issues.

The NATO group, including representatives from the Joint Theater Surety Management Group (JTSMG) and security staff from NATO facilities in Europe, convened at Sandia for two weeks of intensive computer "gaming" to evaluate security arrangements at NATO air bases.

To describe the drills as "gaming," though, hardly does justice to simulation exercises that were real enough to cause sweaty palms, accelerated heartbeats, and adrenaline-pumping interaction.

"Yeah," says Ric Davis, Manager of EUCOM Support Dept. 5833. "It gets pretty intense and competitive. The guys get emotionally involved in the scenarios."

Ric, who works out of HQ USEUCOM (Headquarters, US European Command) in Stuttgart, Germany, as Sandia's representative for the JTSMG, organized the session.

### Two weeks, 30 scenarios

During their two weeks at Sandia, participants conducted 30 exercises using JTS, the super-sophisticated combat simulator developed at Lawrence Livermore National Laboratory with DOE and DoD funding. Sandia uses the software to conduct security evaluations and training for DoD and DOE sites across the country. This

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# Sandia LabNews

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## Sandia, Lockheed Martin earn award for Outstanding Business in Philanthropy

### Fund-raising executives recognize Sandians' tradition of giving

Sandia employees' long-standing traditions of caring and giving to others in need and improving the community's quality of life received a very high honor this week.

The New Mexico Chapter of the National Society of Fund Raising Executives awarded its Outstanding Business in Philanthropy Award to Sandia and Lockheed Martin at a luncheon ceremony on Nov. 17.

Director of Public Relations and Communications Center 12600 Don Carson accepted the award on behalf of Sandia.

"These volunteer activities and contributions to the community are concrete examples of Sandia and Lockheed Martin's commitment to making Albuquerque a better place for our families to live and work," Don says. "Being a leading corporate citizen is very important to both Sandia and Lockheed Martin."

*"The commitment to the people of New Mexico that [Sandia and Lockheed Martin] demonstrate daily is exemplary."*

Since 1982, Sandia has held the distinction of being the first and only organization in New Mexico to contribute in excess of \$1 million every year to United Way.

"The commitment to the people of New Mexico that the management of Sandia National Laboratories and its operating contractor, Lockheed Martin Corporation, demonstrates daily is exemplary," says Jack Holmes, executive director of United Way of Central New Mexico. Sandia employees received special United Way recognition last year for having raised through the Employee Contribution Plan more than \$1 million a year for 13 consecutive years. (See "ECP campaign raises more money than ever before for United Way agencies" on page 5.)

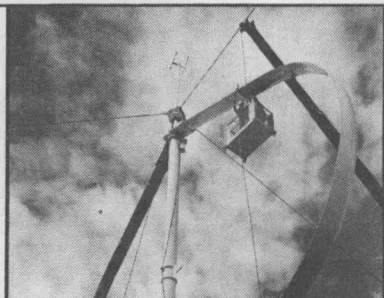
### More than 2,000 volunteers, too

Sandia and Lockheed Martin provide financial support for numerous other charities, including educational, youth, cultural, and human service organizations. The largest gift ever made to the New Mexico Museum of Natural History and Science was a recent leadership gift of \$1 million from Sandia and Lockheed Martin toward the construction of a new large formal theater. Similarly, a grant from Sandia is helping to make the

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Labs boots up for SC97 computing conference in San Jose 3

NM Sandians give more than ever before in 1997 ECP campaign 5



7 John Crawford discusses budgets, hiring, & more at dialogue sessions

8 17-m Vertical Axis Wind Turbine comes down after two decades

# This & That

**"Toasty toes" time today** - Right now, while you're thinking about it, is a great time to help a wonderful cause - Sandia's annual Shoes for Kids campaign, which provides new shoes for poor Albuquerque kids. Donating is so easy. If you have a Sandia Laboratory Federal Credit Union account, pick up your phone and call 293-0500 and ask that your donation be transferred directly from your account to the Shoes for Kids account. You can also deliver or mail a check to either Albuquerque SLFCU location (mailing address is P.O. Box 23040, Albuquerque, NM 87192-1040); make checks payable to SLFCU and note at the bottom: For benefit of Shoes for Kids, account #223180.

Donations of any amount are welcome, but \$25 buys one pair of high-quality shoes for a needy child, says campaign coordinator Pam Catanach (12650). If you donate by Dec. 9, your money will "shoe a kid" before the holiday season. And if you make your donation before Nov. 27, Pam and I guarantee your Thanksgiving turkey will be juicy and tender.

\* \* \*

**Resounding results!** - Speaking of giving, you generous Sandians have outdone yourselves this year, pledging a record \$1.6 million-plus in this year's Employee Contribution Plan/United Way campaign. This is about five percent more than was raised last year, and Sandia has fewer employees now. Even more impressive: the average gift per participant is \$308, a whopping eight-percent increase. For details, see Janet Carpenter's page 5 story.

\* \* \*

**One year on the Web** - Many employees and retirees already know how easy it is to access the major Lab News stories on the Web. From the Internal Web home page, click on News Center, then on Lab News. On Sandia's External Web, see <http://www.sandia.gov/LabNews/LabNews.html>, or from the home page (<http://www.sandia.gov>), click on News Center, then on Sandia Lab News.

LN writer/computer whiz Bill Murphy puts the major articles on the Web as soon as possible after the paper copy goes to press and often has them on by the official Friday publication date. At the end of the current articles, you'll find a link to previous major articles that go back to October 1996. We're sorry we don't have the staff time or money to put all Lab News articles on the Web, as many of you would like; we do all we can do while staying both solvent and (relatively) sane.

\* \* \*

**"Coll-Okie-isms"** - Between the times I visit with my Oklahoma relatives and friends, I sometimes forget how colorful their speech and stories are. During my recent visit with a fair-sized pack of Okies, one said he'd been so nervous lately that he had to start the sewing machine so he could thread the needle. Another, after sitting down to a meal that looked like beef, said, "Um-um-um, possum, the other red meat!"

- Larry Perrine (845-8511, MS 0167, [lgperri@sandia.gov](mailto:lgperri@sandia.gov))

## What's your VP doing about the Sandians' Perspective survey? New Web site tracks survey actions

Remember the Sandians' Perspective survey? Remember when Sandia's executive management promised to use your opinions to forge a better workplace?

Now you can find out what's being done in your organization to address problems identified in the survey with just a few clicks of your mouse. A new Web site developed by Sandia's Strategic Human Resources Planning (SHRP) team contains

specific information about the status of Sandians' Perspective initiatives in each division.

To find the site, select Communications from Sandia's Internal Web home page, then Surveys, or type in <http://www-irm.sandia.gov/corpdata/perspective/diviin.htm>.

The site's content, submitted by division and center offices, is the result of months of work to transform the Sandians' Perspective data into meaningful change. Each division's link details the status of initiatives in four categories (line of sight, management credibility, people management effectiveness, and accountability) corresponding to the four corporate goals identified by the SHRP team last year. (*Lab News*, Aug. 16, 1996) Sandia's VPs pledged last August to use the four corporate goals to develop these specific action plans for their divisions.

Bob Eagan, VP of Physical Sciences and Components Div. 1000, for instance, is using lunches with various employees to address the corporate-wide "management credibility" issue, according to the "Division 1000" link. The National Security Div. 5000 link shows how people-management skills are being used as a criterion for promotions and how new managers are now required to get management skills training.

"The site demonstrates how the individual Sandia organizations are consciously moving forward to make improvements," says SHRP co-chair Nina Chapman (3000). "We want employees to know they've been heard and to be able to see how their opinions are shaping their workplaces."

The next Sandia employee opinion survey is being planned for 1998, Nina says.

## Nominations sought for Labs' 5th annual Employee Recognition Awards program

Over the past four years, more than 400 individuals and 25 teams have been recognized through the Employee Recognition Awards (ERA) program. In the program's fifth year, Executive VP John Crawford encourages Sandians to honor individuals and teams who have made outstanding contributions to Sandia's success.

"Here's your chance," says John, "to call special attention to Sandians who have gone the extra mile and whose work or contributions you believe have been exceptional. Take the time to nominate deserving colleagues for an Employee Recognition Award."

Nominations will be accepted from Nov. 21 through Jan. 8. This year there are four nomination categories. One is for teams and three are for individuals: technical excellence, exceptional service, and leadership.

Nomination forms with detailed instructions are available in California from your division office and in New Mexico from your division office, HR representative, and HR customer service manager. Nomination forms are also available on Sandia's Internal Web homepage or at <http://www-irm.sandia.gov/era/98era.htm>.

The primary requirement of the nomination process is that the nominee's accomplishments be described in 250 words or less. An optional one-page supplement may be added for supporting evidence. Individual nominees must be current, regular Sandia employees. Team members may include nonregular employees and contractors.

Anyone may nominate individuals or teams with the concurrence of any Sandia manager.

### Process simplified this year

Individual recipients and a designated representative from winning teams will be recognized at a special awards dinner on May 16, 1998.

According to Human Resources Div. 3000 VP Charlie Emery, the nomination and selection process has been simplified this year. The winners will be selected at the division level so that the decision-making process is closer to the people and their work. Divisions will be allocated slots for awardees based on their division on-roll population as of October 1997. A combined total of 120 individuals and teams will receive corporate 1998 Employee Recognition Awards.

From Sandia's 1998 ERA winners, Paul Robinson and John Crawford will select the two nominees that will represent Sandia in the Lockheed Martin NOVA awards program. This prestigious annual awards program honors 50 individuals and teams across the Lockheed Martin Corporation who have made outstanding contributions to Lockheed Martin Mission Success.

## Sen. Domenici to speak at CNSAC Friday morning

Sandians are invited to hear Sen. Pete Domenici, R-N.M., talk about "Perspectives from Capitol Hill" on Friday, Nov. 21, in the Center for National Security and Arms Control (CNSAC, Bldg. 810) auditorium at 10 a.m. A question-and-answer period will follow. Because seating is limited and on a first-come basis, the talk will be broadcast live to the screen in the TTC auditorium (Bldg. 825). It will also be broadcast live to the Sandia/New Mexico video monitors and will be taped; see the *Sandia Daily News* for more information. Watch for coverage of the talk in the next *Lab News*.

## Take Note

Retiring and not seen in *Lab News* pictures: Arlyce "Archie" Stannish (10244), 31 years; Franklin Ezell (6524), 30 years; James Powell (9300), 28 years; and Johnnie Nevarez (1412), 23 years.

## Sandia LabNews

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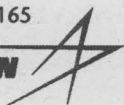
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Ken Frazier, Editor .....505/844-6210  
Barry Schrader, California site contact .....510/294-2447  
Lab News fax .....505/844-0645

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LOCKHEED MARTIN



# Supercomputing and more star at Sandia-chaired SC97 conference in Silicon Valley

Research-and-trade convention culminates two years of planning with Dona Crawford

By Nancy Garcia

Because high-performance computing and networking are critical to Sandia's national security role, 8900 Director Dona Crawford's stint as chair of the SC97 computing conference underscores her "day job."

The aggregate of networking, storage, computers, operating systems, tools, environments, and applications that makes up the fabric of our young information age supports or enables Sandia's missions in stockpile stewardship, nonproliferation, emerging threats, and critical infrastructures, she said in an advance media briefing.



DONA CRAWFORD

Dona anticipated that the conference, which began Monday, Nov. 17, in San Jose after opening weekend tutorial sessions, would let the Labs both teach and learn. Sandia planned to showcase a dozen different demonstrations that dovetail with its Accelerated Strategic Computing Initiative (ASCI) collaboration with Los Alamos and Lawrence Livermore national labs. SC97 participants also were treated to a system view of how the work of other suppliers, users, and program managers across the nation fits together.

"In some sense, this is a national program review," she said. "It's been called the 'county fair' for high-performance networking and computing." In its 10th year, the conference has changed its title to "SC" from "Supercomputing" to indicate that it encompasses more than big computers, she added.

## A record 7,000 expected this year

"SC97 is a technical conference with peer-reviewed papers, a trade show, an education program, and a lot more all rolled into one," she said.

It moves annually, and was expected to attract a record crowd of 7,000 this year due to its location in Silicon Valley. The highest number of peer-reviewed papers, more than 350, was submitted this year, for 70 slots.

With funding from DOE, the National Science Foundation, and others, about 150 educators from primary, middle, and secondary schools received stipends to attend.

"Lifelong learning will be part of how we do business," Dona explained.

The teachers are learning what access to high-performance computing would be available to them, she said. They were invited to hear an address by Glenn Seaborg, codiscoverer of plutonium and head of a children's educational museum, the Lawrence Hall of Science, in Berkeley.

Other invited speakers discussed the state of the field in computer architecture, programming, networks, and visualization techniques. DOE Assistant Secretary for Defense Programs Vic Reis gave a plenary awards speech and moderated a panel on the state of simulations with aerospace and automotive representatives.

Although programs like ASCI are speeding simulations R&D, Dona said, "You couldn't conceive of this 10 years ago because we didn't have the computers — and we're still a long way from simulating reality. We can only approximate reality, not duplicate it."

Yet she foresees in another decade or so being able to remotely attend meetings as a "digital proxy" hologram. By then, she says, developments currently in the labs, such as videoconferencing, will be in our homes and communities.

## Embedded home units?

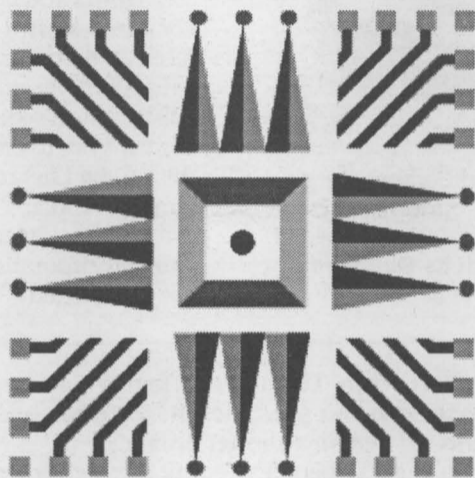
One day she envisions a unit combining television, telephone, and computer embedded in homes like plumbing is today, providing a data

window to the outside world and to services beyond the home, such as medical screening.

"We'll find other unanticipated uses," she added. "You don't know you need this until you have it. . . . We're still at the very beginning of the information age, so we can only guess what the uses will be — and we always guess wrong."

In fact, when she was elected to chair this year's conference five years ago, her vice chair David Cooper was at NASA-Ames in Mountain View, Calif., instead of LLNL, and the ASCI program didn't exist.

It has taken two years to plan and coordinate the conference. Dona has overseen appointing volunteer committee chairs and attended some eight days of meetings in the last year. Leading up to the conference, Dona received hundreds of e-mail messages each day. Still, she found chairing SC97 has aided her work responsibilities to fashion



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## Sandia California News

a Center portfolio ranging from distributed computing research to site phone services.

Rick Maurer (8930), John Laroco (8950), Jim Brandt (8930), and another eight or so Sandians have spent five weekends pulling about 20 miles of optical fiber through the San Jose convention center and turning on the networks. The \$150,000 of equipment will remain behind once the conference is over, along with much more extensive documentation on all the facility's networks than existed previously.

"It takes tremendous effort to make this work," Dona commented, "but volunteers don't know what they can't do."

Meanwhile, Juan Meza (8950) persuaded college students to work the conference in exchange for free admission. Jeff White (4817) developed the Web site for the History of the Internet Exhibit, and David Fortner (8920) developed an animated video that Dona considers "way cool" to show the 2,500 people at the keynote address.

## Sandia's distributed way of operating

Sandia shared a 2,000-square-foot demonstration booth with its two ASCI partners, where each lab had some individual demonstrations as well as joint ones.

"A unique strength at Sandia is our distributed way of operating," Dona said. "We bring a different view and solution to any problem."

For instance, a Sandia team led by Jeff Jortner (8920) showed an approach to quickly transmit large visualization files by sending MPEG versions instead of streaming data (which requires more bandwidth and can be less reliable). The demonstration was networked to Albuquerque and back so data moving 2,200 miles would appear accessible in real time.

Robert Clay (8950), David Greenberg (9223), and co-workers showed a clustered approach to supercomputing in which networked work stations function in an aggregate mode roughly an order of magnitude below the computing power of ASCI machines. This approach, termed Cplant, for computational plant, will thus provide a teraflop (trillion floating point operations per second) of computing power when ASCI supercomputers attain 10 teraflop operations. That approach should be very important to non-weapons research labs and to businesses that can optimize operations by modeling their functions to predict best practices, Dona said.

*"It takes tremendous effort to make this work, but volunteers don't know what they can't do."*

Another sort of weaving together of capabilities was presented in the Product Realization Environment, or PRE, in which various applications for manufacturing design, modeling, and visualization can function in a "plug-and-play" way. This copyrighted means of combining software is available for strategic partnering and is being used or evaluated by Goodyear, Lockheed Martin, the National Electronic Manufacturing Institute, and the extreme ultraviolet lithography project.

Also, Dino Pavlakos (9215) demonstrated the Parallel Volume Rendering (PVR) system, interactively visualizing a one-billion-cell data set on the teraflop machine and a prototype system for immersive visualization of computational meshes.

Steve Wix (1252) presented an electrical simulation and modeling poster that describes the use of teraflop performance to accurately predict the performance of large-scale electrical systems.

Lyndon Pierson (4616) had an ATM encryption demonstration to show robustness-agile encryption of integrated voice, video, and data over high-speed shared ATM/SONET media.

Gary Randall (2645) had a poster showing how modeling and simulation are being used to predict component behavior, for electromechanical sensing devices, for instance.

Eliot Fang (9232) and Edward Hoffman (9117) had a poster on the aging of solder joints, showing results from a multilevel simulation methodology that links simulation codes of continuum mechanics (JAS3D), microstructural mechanics (GLAD), and microstructural evolution (PAR-GRAIN).

Rudy Matalucci (5822) had a poster display presenting results of SPH-3D PRONTO calculations of DoD- and GSA-typical structures and barrier walls.

Randall Summers (9231) presented a demo on ALEGRA, a code being used on the teraflop supercomputer developed for ASCI to conduct advanced 3-D simulations of systems and phenomena important to stockpile stewardship.

It takes a lot of people and a lot of hard work to put together a technical conference as big and as diverse as SC97, Dona says. Not all the Sandians who participated are listed here.

## ★ Congratulations

To Timothy (8114) and Deborah Sa, a son, Kyle, Sept. 26.

To Cornelia and Frank (10509) Villareal, a son, Steven Anthony, Sept. 18.

To Kate Trauth (6832) and John Gahl, a daughter, Martha Trauth Gahl, Sept. 22.

To Teresa and Jake (6313) Deuel, a daughter, Adrianna Grace, Sept. 23.

To Kathy and Jay (2161) Vinson, a son, Whit Miller, Sept. 27.

To Bonnie and Ken (6321) Konopka, a son, Joshua, Oct. 2.

# Philanthropy

(Continued from page 1)

dream of a new Hispanic Cultural Center a reality.

Some of the other groups that benefit from Sandia support include Search and Rescue groups, the Albuquerque Biological Park, Youth Development Inc., Junior Achievement, the Albuquerque Indian Pueblo Cultural Center, Albuquerque Public Schools, Shoes for Kids, the Thunderbird

Awards, the South Highway 14 Village Project, the Martineztown Project, and individual work place drives and volunteer activities.

More than 2,000 Sandia employees also volunteer their personal time at nonprofit agencies throughout the region, providing more than 50,000 hours of service to the community. These efforts range from putting on a fresh coat of paint to offering technical support to providing direct services to New Mexicans in need. Many Sandians also serve in leadership roles for nonprofit organizations.

Sandia/Lockheed Martin has provided leadership in support of New Mexico's young people through the Sandia-supported Science Advisor (SCIAD) program and a Science, Math, and Resources for Teachers (SMART) library for distribution of hands-on math and science materials.

Sandia and Lockheed Martin recently partnered with Albuquerque Public Schools and United Way to create the Sandia Literacy Project. Sandia, through Lockheed Martin Corporation, has committed

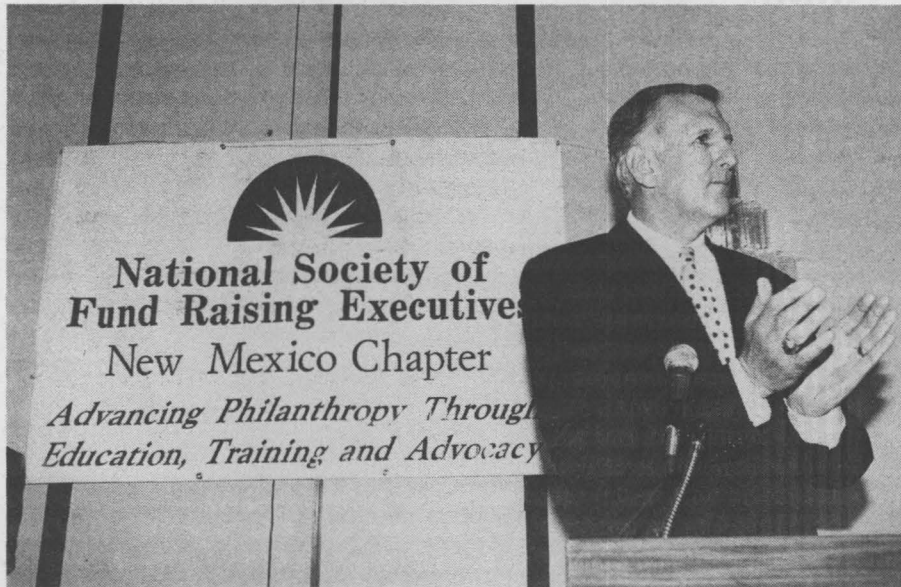
\$150,000 and volunteers to help classroom teachers at Wherry Elementary School on Kirtland Air Force Base implement a successful model literacy program. The goal of the program is to get all children at Wherry reading at grade level by the end of the third grade. Project developers hope the program will be independent at the end of the three years.

Shoes for Kids, a program that started as a grass-roots campaign more than 40 years ago, saw donations almost doubled in 1996 from the funds donated during the 1995 campaign for a total of approximately \$11,300. Shoes for Kids served 18 schools last year for a total of about 450 children in grades 1-5 and a grand total of more than 6,000 pairs of new shoes since the program's inception.

"This is a chance to recognize all the Sandians who give and help out in their community," says Don. "No company I've ever seen does what Sandia does in terms of giving."

—Janet Carpenter

*"No company I've ever seen does what Sandia does in terms of giving."*



GIVING APPLAUSE — Don Carson, Director of Public Relations and Communications Center 12600, applauds Sandians for their tradition of giving during a Nov. 17 awards ceremony, at which the New Mexico Chapter of the National Society of Fund Raising Executives honored Sandia and Lockheed Martin with its Outstanding Business in Philanthropy Award. Don accepted the award on behalf of Sandia.

## Retiree deaths

William Leslie (79).....	2512.....	Oct. 9
Edwin Allen (92).....	4254.....	Oct. 13
Richard Cash (72).....	3435.....	Oct. 13
Joseph Brown (58).....	1744.....	Oct. 15
Frank Sanchez (75).....	7471.....	Oct. 15
Lawrence Bowen (84).....	3645.....	Oct. 20

# Transmission

(Continued from page 1)

is important. Other possibilities include sensors that can communicate with each other aboard an aircraft, and in optical telescopes and optical switching for telephone lines.

Sandia has licensed micromachine technology to private industry to build cheaper, more effective air bag sensors in cars, as well as to create newer anti-skid technologies currently being developed in the auto industry.

Basic engineering research should also benefit from the device, says Jeff. "Micromachine science does not yet understand how to deal with the effect of friction on machines that are so small," he says. "To study how these effects and others operate, you've got to be able to apply a significant level of force. Now we can apply these forces in fundamental tests to determine qualities such as a micromaterial's fracture strength."

Power in larger amounts than first thought necessary is needed at the micromechanical level because of the relatively large amount of adhesion and static friction — together termed 'stiction' — that a stationary gear must overcome in order to begin movement. One cause of stiction is that after a gear is etched out of silicon, the surface of the silicon oxidizes — in a sense, rusts — into glass, which binds microaxles or microgears to stationary surfaces surrounding them.

"Even minute amounts of water vapor and outgassing from epoxies can be significant in blocking the startup action of a microgear," says Jeff. "Power is needed to overcome that resistance."

### Atomic-scale displacements

The microtransmission also may one day provide accurate displacements on the atomic scale. One revolution of the demonstration drive gear generates a calculated displacement of the output gear of only 0.8 angstroms — the same unit of measurement normally used to determine spaces between atoms.

The gearing is reversible, and so can increase speed as well as decrease it.

Micromachine transmissions operate on the same principle that allows a multigear bicycle to be pedaled up a steep hill more easily than a single-speed bike: No more input force is used, but gears apply the force over a shorter portion of

the wheel's turn. The new distribution of energy slows the bike but magnifies the force because it is concentrated on a shorter distance.

"In general, people needing this technology would use much lower gear ratios than three million to one, since the power and precision that this demonstration assembly offers would be required only in very special cases," says Steve. "But since the assembly is modular, they can easily do as little or as much as they'd like."

The gearing is driven by a five-level micromachine, believed (like the transmission) to be the most advanced motor of its kind in the world. Like its earlier siblings, it is powered by comb drives, but these are thicker and stronger.

Each drive consists of two tiny comb-like structures, with teeth of one lying between the teeth of the other. By alternating tiny electric signals to the combs, they attract each other to one side and then the other. The motion is transmitted to a tiny piston-like linkage moved by one of the combs.

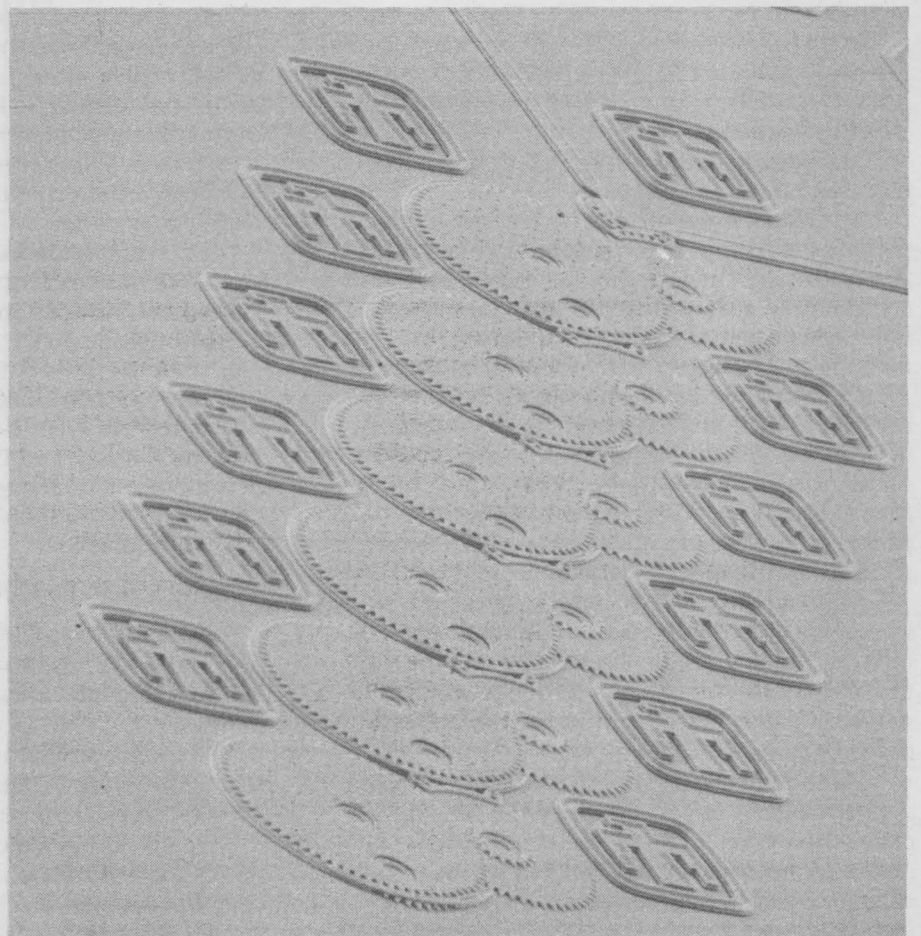
A second comb drive provides power at right angles to the first. The piston it drives, when synchronized with the force of the first piston, is sufficient to turn a drive wheel on the microengine.

Micromachine "levels" refer to the multiple tiny elevations needed to separate a gear or row of comb "teeth" from each other and their substrates in order to move freely. This is done by etching away so-called "sacrificial" oxide layers. The creation of additional levels permits stronger comb drives

and allows more gears to overlap each other, compressing the amount of horizontal space needed. While other laboratories have built three-level machines, there is no known competitor to the Sandia five-level machines, which require sophisticated design and processing knowledge.

The fabrication method has been used to create previous generations of four-level Sandia micromachines that spin at hundreds of thousands of revolutions per minute.

The microtransmission results from work carried out in centers for Surety Components and Instrumentation 2600, Microelectronics and Photonics Core Competency 1300, Materials and Process Sciences 1800, Physical and Chemical Sciences 1100, and Electronics Components 1200.



SANDIA'S 3 million:1 transmission, featuring six intermeshing gearing reduction units, each with gears in ratio of 1:3 and 1:4. Each single transmission assembly (six are shown) is capable of being duplicated and meshed with other assemblies. The gear wheels are each about the diameter of a human hair.

## ECP campaign raises more money than ever before for United Way agencies

The Employee Contribution Plan/United Way (ECP/UW) campaign figures are being tallied, and according to the latest information, Sandia employees' response to the community is "one great deed" — we raised more dollars than ever before and with 350 fewer employees.

This year's goal was \$1.525 million. As of Nov. 13, pledges totaled \$1,555,544. Lockheed Martin's corporate gift was \$50,000. That leaves a campaign total of \$1,605,544. Last year's campaign raised \$1,529,000 including the corporate gift, so this year's total is 5 percent higher.

Participation in the Leadership Giving campaign, a separate campaign for vice presidents, directors, managers, team supervisors, and union leaders, increased by seven percent, and total dollars raised exceeded \$470,000.

### More dollars, fewer employees

"This year's ECP/United Way campaign is the best ever in the sense that we raised more dollars than ever before with fewer employees," says 1997 campaign chair Jackie Kerby Moore (4000).

Total participation is at 75.9 percent, up slightly from 74.96 percent a year ago, and the average gift per participant is \$308, an eight-percent increase over last year.

Jackie noted, "The average increase this year is more than the average raise package. That's outstanding!"

"Sandians continue to show tremendous generosity and support in our community and we want to thank all those who participated," says next year's ECP/UW chair Bruce Fetzer (12680). "We want to recognize the good work done by the center representatives, the time and energy they put into this campaign — the results are a reflection of their commitment."

### United Way serves 1 in 3

Sandia Director and President C. Paul Robinson's remarks in a memo to employees dated Oct. 27 illustrate how Sandians' contributions help their communities: "My sincere thanks to all of you who participated in our Employee Contribution Plan (ECP)/United Way campaigns in the past. Your gifts continue to help build a better community of successful children and youth, as well as independent adults and seniors. I recently read a statistic indicating that 1 out of every 3 people in central New Mexico are served by United Way — your dollars are helping your own family members, friends, neighbors, and co-workers."

## Sandia holiday drives

If you are interested in collecting items from your group for a community agency during the holidays, here are guidelines suggested by the Sandia Volunteers Program:

1. Notify Redd Eakin (12650) at 284-5209 to indicate your interest and to be connected with suitable agencies based on your desired focus. Redd will send volunteers a 16-page "Holiday Sharing" booklet from United Way that lists community needs and people to contact.
2. A volunteer from your organization will be responsible for delivering the collected items. There is no case number for time spent.
3. Collect in small file-size cardboard boxes for easy transport.
4. Do not accept monetary donations.
5. Keep an estimated record of total collected.

## Sympathy

To Jennifer Padilla (5331) and Brian Griego (7435) on the death of her father and his father-in-law, Larry Padilla, in Albuquerque, Oct. 26.

## Base security

(Continued from page 1)

month's exercise was the second conducted here for the NATO group using the JTS system.

"The study was very useful, especially because there were different nations involved and we could learn from their experience and their way of working," says participant Major Jos Nys of the Belgian Air Force. "The people with whom we were working were very professional and highly motivated."

The Joint Tactical Simulation environment is uncannily realistic. It accurately models terrain features in urban and rural environments. It models weather, lighting conditions, and weapons capabilities. With easily changed data drawn from maps and photographs, JTS recreates real facilities down to a very fine level of detail. Buildings are where they're supposed to be, walls as high, forests as dense, and rivers as wide. And JTS simulations run in real time. If it takes a humvee five minutes to drive down a real fence line at a particular base, that's how long it takes in the simulation.

### Aggressors and defenders

Here's how the NATO drills worked: The group, including representatives from Germany, Belgium, the Netherlands, the United Kingdom, and the US, divided into two teams, one playing the role of aggressor, the other playing the defender. The aggressor's job was to try to penetrate a NATO air base. The defenders, of course, wanted to foil them. Each side planted itself around a large computer monitor. They could see only what their computerized forces could "really" see if they were in the same situation at the actual base.

The participants' commands were executed by Sandia JTS system operators.

The aggressor, by definition, made the first move. Its penetration attempt could come from anywhere around the base perimeter and could employ various numbers of personnel using a variety of weapons. As in the real world, the defenders wouldn't know anything in advance. They were obliged to wait and be ready to respond. Once the action was initiated, though, it was a free-for-all — no waiting for turns, any more than attackers politely wait for defense forces to marshal their forces before making their next move.

JTS is ideal for the NATO training exercises, says Ric, because it allows a small group of participants to quickly evaluate the effectiveness of changes in security systems: what happens if

we put a wall here, a suite of sensors there, an additional vehicle patrolling the perimeter after dark? Likewise, Ric says, the simulation lets security specialists get a quick take on potential "holes" in their systems, holes that real aggressors can exploit.

"We can get a pretty quick read on how well a proposed change in security will work," Ric says.

"The JTS is an extremely useful and effective training and evaluation tool," says Major Nys. "There are, of course, some limitations and artificiality because it is a computer simulation and not real life.

That is why a study with JTS should always be followed up by another evaluation or study tool. JTS can also serve as that 'other' tool. It's also very important to keep in mind that the computer doesn't 'prove' or 'disprove' some outcomes."

Captain Wim Beckers of the Royal Netherlands Air Force agrees. "The JTS is very useful as a tool to determine how to train and operate troops and for the evaluation of operations," he says. "You have to keep in mind, though, that it will always be a computer model; reality will differ from the [computer] scenario."

### Flexible, accessible, realistic

Joe Sandoval, a vulnerability analyst in Systems Analysis/Development Dept. 5845, is Sandia's JTS system administrator. He uses JTS as one of several tools for evaluating security systems at DOE and military installations across the country. He likes JTS's flexibility, its accessibility, and especially its realism.

"There are other simulations out there," says Joe. "Marine Doom, based on the popular Doom computer game, is among the best-known. It has a very nice front end, a 3-D, first-person perspective, but there's no underlying core."

JTS, he says, is just the opposite — its front end isn't the flashiest in the world, but it is incredibly realistic in the way it models the world. "Its strength," says Joe, "is that the algorithms



INSTANT REPLAY — Participants in a recent NATO security evaluation session at Sandia watch an "instant replay" of a computer-simulated scenario in which aggressors sought to take control of a NATO air base. Sandian Ric Davis (standing, second from right in rear) organized the two-week-long training session.

(Photo by Randy Montoya)

mimic real life better than anything I've seen."

Joe and Ric agree that JTS simulations can't replace flesh-and-blood "force on force" training exercises, but they can be a powerful supplement to them.

"With JTS," Ric says, "we can run many variations in a week; with a live-action exercise, we can run only a few."

Other pluses for JTS: it's relatively inexpensive, it's environmentally friendly, and it's safe (people can get hurt in live-action drills).

Ric says he'd like to make the NATO exercises an annual affair. That would be just fine with Major Nys and Capt. Beckers.

"I enjoyed my trip to New Mexico very much," says Major Nys. "It is a great place to be, and after a week back in Belgium I'm already missing Albuquerque and its nice and friendly people. I hope I'll have the opportunity to come back in the future."

Says Capt. Beckers: "The stay in New Mexico was very pleasant; I enjoyed it very much. I'd like to thank the people at Sandia Labs, especially Jim Blankenship [5845] and all the other [JTS] operators for all the help they gave us. It was a perfect time."

In addition to Ric, Joe, and Jim, other Sandians involved in the NATO exercise were Paul Weber (5822), Mike Benson and Teresa Torres (both 5845), Ralph Garcia and Dale VanDongen (both 7432), and John Lavasak (6313).

# Getting plugged in: Sandia ambassador bridges distance between Bethesda and Albuquerque

By Bill Murphy

In a recent corporation-wide communications survey, Lockheed Martin found that, justifiably or not, employees across all 50-some business units feel information from senior management has been filtered through too many levels to be credible. The unsurprising result? Employees feel "unplugged" from corporate goals; they perceive a major disconnect between their individual jobs and the strategic ambitions of the corporation.

In response to the survey, Lockheed Martin established the Ambassador Program. Each business unit, including Sandia, recently designated a staff-level "ambassador" to represent the unit and its employees in Bethesda during a full day of meetings and briefings with upper-upper corporate and sector executives.

The idea is that the ambassadors will serve as messengers, bringing the "unfiltered" word from Bethesda directly to their peers, and likewise bringing employee concerns directly to the attention of the corporation's senior decision makers.

Sheryl Hingorani of Laboratory Planning and Evaluation Dept. 4512 was appointed by Paul Robinson, after a Sandia Laboratories Leadership Team nomination process, to serve as Sandia's ambassador.

Sheryl's first order of business was to visit with peers around the Labs to talk about issues of concern that Sandians would like to raise with Lockheed Martin senior management.

"I talked to a lot of folks and I looked at a lot of stuff," Sheryl says. "I had no shortage of material."

Once the ambassadors from all the business units convened in Bethesda, they consolidated 150-plus issues into five overarching issues that employees across the Lockheed Martin family of companies are concerned about. Here are those issues, along with some suggested corporate responses developed by ambassadors during a series of breakout sessions:

• **What should we do to attract new people into the corporation?**

"I've been doing some work on Sandia's data on that," Sheryl says, "and it is a fact that the defense sector including Sandia, including Lockheed Martin, has a difficult time right now



AMBASSADOR — Sheryl Hingorani represented Sandia in the inaugural meeting of the Lockheed Martin Ambassadors Program in Bethesda. (Photo by Randy Montoya)

attracting the best and brightest. That's especially true in computer science, which is such a fundamental part of the way we do science and engineering today."

*Key breakout session recommendations:*

The corporation should deal with candidates, as it would with customers, on the basis of price, product, and promotion. In the area of price (i.e. compensation), the corporation's philosophy of paying at midpoint of market range may convey an image of mediocrity.

• **How can we do a better job of training people at or below the director level?**

*Key recommendations:* The corporation should make a greater effort to leverage its size to make training more affordable to business units. Also, corporate headquarters should consider requiring business units to submit annual training plans. Other recommendations: Better communications to make employees aware of training opportunities and creation of mentoring or apprenticeship programs as a source of low- or no-cost supplemental training.

*The idea driving this strategic thrust is to consolidate the nation's defense industry in response to the declining DoD market.*

• **What types of information do employees need that they are not now receiving, and how should that information be provided?**

*Key recommendations:* Employee information needs should be viewed as a series of concentric circles with the most important issues at the center and least important on outer rings. The inner circle in this model is compensation and benefits; the next ring outward is work environment, then career goals, and, ultimately, strategic planning at the corporate level. Communication efforts must address the innermost circles credibly and comprehensively. If the company does not respond to these employee interests and concerns, employees will lack the sense of security and stability essential to fully engaging in the business and its long-range plans and goals.

• **How can our operating units work better together and what can management do to facilitate that?**

*Key recommendations:* Management should improve communications among business units because the ability to work together requires that business units know who does what and that all employees have ready access to appropriate levels of information.

• **What should we do to get all employees involved in the corporation strategy?**

*Key recommendations:* a) Place greater emphasis on showing how their business units' work relates to higher level corporate strategies; b) Align incentives with performance at all levels.

Lockheed Martin Chief Executive Officer Vance Coffman promised the ambassadors that the concerns and recommendations would receive prompt corporate attention. That process is under way.

While Sheryl and her colleagues from throughout the corporation offered senior management a perspective on grass-roots concerns, corporate executives shared some of their thinking on the company's present status and possible future direction. As an ambassador, part of Sheryl's responsibility is to convey these high-level perspectives back to her colleagues at Sandia.

Here's what she heard from Coffman, Chief Operating Officer Pete Teets, Executive VP and  
(Continued on next page)

## Key impression of Ambassadors conference: 'A better appreciation for how highly regarded Sandia is in Lockheed Martin'

Lockheed Martin thinks the world of Sandia National Labs — that's one of the major impressions Sheryl Hingorani brought back from the first-ever ambassadors meeting in Bethesda.

During a two-hour working lunch with Energy and Environment Sector ambassadors, Sector President and former Sandia President Al Narath said Lockheed Martin has a sharply different perspective of Sandia than did AT&T, a perspective that doesn't have anything to do with the contract fee. He says it has more to do with the fact that Sandia really fits into Lockheed Martin's core business areas, whereas with AT&T Sandia didn't.

"I really have a better appreciation for how highly regarded Sandia is in Lockheed Martin," Sheryl says. "Just look at the latest issue of *Lockheed Martin Today*. Sandia shows up all over the place, where really, we're a fairly small piece employee-wise and a tiny piece revenue-wise."

Another impression: "I have a better appreciation for the complexity of the relationship among Sandia, DOE, Lockheed Martin corporate

headquarters, and the E&E sector. There are just a lot of complex relationships there. I think Sandia employees sometimes blame Lockheed Martin for things that are really DOE's doing, like changes in benefits, for example. They see it as Lockheed Martin coming in and rocking the boat, when in reality Lockheed Martin is carrying out DOE mandates, which in turn are issued in response to Congressional direction."

And: Sheryl says she considers it unfortunate that "once you get below Sandia's senior management level," there is not a whole lot of identification among Sandia employees with Lockheed Martin.

"I mean, we are going to have *somebody* as our M&O [Management and Operations] contractor, and a large successful high-tech defense contractor seems to me to be an excellent fit, given that we have gone through this decision that we are a national security laboratory. I personally think, after going through the Ambassador process, that we should be very proud to be part of Lockheed Martin."

Diversity: "I was surprised at the diversity of the group of ambassadors — happily, pleasantly surprised. Even though all of our briefings were given by white men in their 50s and 60s, the group of ambassadors was about half women, and there were a number of African Americans and Asian Americans and almost all were in their 30s.

"I came away with a sense that part of the diversity issue — and this is not about Lockheed Martin, this is a broader thing — part of the diversity issue is just going to work itself out over time.

"If you look at people like Vance Coffman and some of the upper management, those guys came into Lockheed Martin 30 years ago with PhDs in technical fields. If you tried to find a woman who came in 30 years ago with an advanced degree in technology, you'd have a pretty hard time. Today, if you look at the ambassador group as maybe a predictor of what the upper management of the company might look like in another 20 years, I think it's a good picture."

# Labs to rev up college recruitment effort, says John Crawford during employee dialogue session

By Bill Murphy

After two years of keeping a low profile in the hiring arena, Sandia is revving up its recruiting efforts, Executive VP John Crawford told an audience of almost 400 Sandians on Monday afternoon during the first of five scheduled employee dialogue sessions in New Mexico and California.

The Labs plans to hire about 250 new employees in each of the next two fiscal years, he said. That's up from 91 new hires in FY96 and 145 in FY97.

An improved spending and revenue alignment makes the new hiring regime possible, John said. In FY95 and FY96 the Labs spent a lot more than it collected in revenue, but inflow and outflow are much more nearly balanced now.

"We need new talent out of the universities," he said, "and we need to sustain relationships we've had with universities. You don't build those relationships overnight." John noted that several VPs have been assigned to cultivate close recruitment and research relationships with specific universities (*Lab News*, Oct. 24).

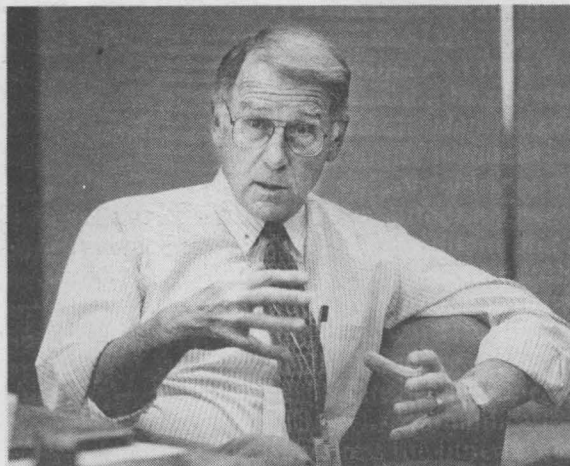
"Increasingly, our hiring focus will be shifting to new grads," John said. "In fact, our goal is [to hire] 70 percent recent graduates. The competition with industry for these people is fierce, especially for graduates in the computational sciences. We're all looking for the same people."

## A period of stability

The aggressive hiring program comes as a period of stability and predictability begins to settle on the Labs, John said.

"We've been through quite a ride" on funding over the past few years, he noted. The low point, he said, came in FY95, when the Labs spent \$100 million more than it brought in. (The difference was made up by tapping "out year" to complete previously committed work.) After that "funding hiccup" the Labs reduced its staff levels — 1,600 people over two years, including 900 regular employees and about 700 contractors. The current total workforce, including 7,500 regular employees and about 1,000 contractors at all sites, appears to be stable through at least FY99. A stable workforce of 7,500 regular employees should enable the Labs to sustain its new-hire goals, he said.

In addition to answering pre-submitted questions about the Labs hiring plans, John addressed



JOHN CRAWFORD

a number of other employee concerns during the hour-long employee dialogue session.

Here's a brief synopsis:

• **Indirect costs:** John said indirect costs have been reduced significantly since FY94. As a result, a greater share of the Labs' total spending is going into direct costs, as desired. The Labs is well on track to fulfill its Curtis Commitment pledge, the promise in FY95 to then-Deputy Energy Secretary Charles Curtis to reduce indirect costs by a total of \$250 million over five years.

• **Retirement fund:** "It's no secret," John said, "that the fund is very healthy." Sandia, he noted, has a "defined benefit" plan, one that guarantees a certain income regardless of the year-to-year performance of the fund. That's counter to the trend in industry, which is moving toward "defined contribution" plans that don't guarantee a specific return. Sandia's retirement plan, he noted, ranked second when compared to 17 benchmarked companies. (The University of California, managers of Los Alamos and Lawrence Livermore national laboratories, ranked first.) When Sandia's employer-funded defined benefit plan and the employee-optional 401(k) plan are considered together, he said, Sandia's retirement benefit is very competitive.

• **Technical managers' compensation:** An industry analysis, John said, demonstrated that members of the technical staff and technical managers both were being compensated (on

average) at less than the industry norm. Managers, though, were not as under-compensated as were technical staff members. As a result, John said, MTS's on average received larger percentage raises in the new fiscal year than did their managers.

• **Status of MA II secretaries:** "There is no truth to the rumor that Sandia intends to eliminate secretaries and go to contracted secretarial support," John said. "That is not on the horizon at all." What is happening is that department secretaries will likely be absorbed into the OPEIU effective after 7/31/99. Here's why: Because of a reorganization process that resulted in Manager I and Manager II levels being consolidated into a single level, MA I and MA II secretaries were grouped into one classification on 10/10/97. As a result, department secretaries will likely become OAs after 7/31/99.

• **9/80 workweek:** "It's great. Everybody loves it and we're going to stick with it," John said. He noted that the Labs had received complaints this spring from customers that they couldn't reach anyone on a Friday. Thus, this caveat: the Labs is open for business five days a week. It is up to department managers to make sure their departments are adequately covered every Friday. "My sense is that we're doing much better with this than we were a few months ago," John said. "9/80 is here to stay unless something really drastic happens."

• **Space consolidation:** With fewer employees and several new buildings, why do things sometimes still seem crowded? "We haven't been using all our space very effectively," John said. But steps are being taken to remedy that. People are being moved, space is being used more efficiently, but it's not a process that happens overnight. Progress is being made, though. "Nothing warms my heart better than seeing them cart those temporary buildings away," he said.

• **Telecommuting:** The Labs has not had a formal telecommuting policy, but with increased interest in the subject, John said, it's likely a policy will be developed in the foreseeable future. "My experience is that it's a good thing in some very specific circumstances . . . but it's not something I would see being practiced on a large scale."

• **A VSIP on the horizon?** "Nope."

(Continued from preceding page)

Chief Financial Officer Marcus Bennett, and the VPs of strategic development, domestic business development, international business development, and human resources.

## A three-part strategy

Says Sheryl: "Lockheed and Martin Marietta were both in the defense business, with DoD as their primary customer. Most of their revenue came from defense contracts. After the Cold War, both companies were looking at what they were convinced would be a permanent, or at least very long-term, flat-to-declining market — not a temporary downturn, but something that they'd have to have a long-term strategy for dealing with."

What they came up with, Sheryl says, is a three-part strategy.

"The first part of the strategy," she says, "is merger and acquisition, which began with the creation of Lockheed Martin and continues with acquisitions such as Loral, Grumman, and others. The idea driving this strategic thrust is to consolidate the nation's defense industry in response to the declining DoD market."

A key component of this consolidation strategy, Sheryl says, is to go all-out to secure the contract for the Joint Strike Fighter. In fact, Sheryl says, the corporation characterizes the JSF contract as a "must-win." The stakes are huge: the winning bidder could get orders for as many as 3,000 aircraft over 50 years with a total value of up to \$800 billion in 1997 dollars.

The success of the mergers and acquisitions

strategy, says Sheryl, depends entirely on the ability to capitalize on some synergies and to implement shared services.

"The second part of the strategy is to identify and pursue high-growth opportunities closely related to Lockheed Martin's core business and core technologies. Lockheed Martin has decided to focus special efforts on commercial space communications and information services.

"It is amazing to me," Sheryl says. "Lockheed Martin is now doing information service outsourcing for Toys R Us. That makes you realize, wow, they're willing to look at anything that allows them to leverage their capabilities into new arenas. They clearly see this [information services] as a big growth market, so they're doing child support enforcement, they're doing air traffic control management. They're also going into joint ventures and pursuing satellite communication networks, an industry that will just keep getting bigger and bigger."

## Going global

"The third part of the strategy is to take their business global, to expand from about 5 percent of total sales from outside the US in 1992 to about 30 percent by 2001. They're putting a lot of emphasis on that these days."

Sheryl says the corporation has identified more than 800 specific foreign business opportunities and plans to pursue the most promising with the same kind of determination that has characterized its involvement in other markets.

"Vance Coffman made it very clear to us that the main driver behind the corporation's strategy

is shareholder value," she says. "They've looked at ways to increase value in a shrinking market."

So far, that strategy seems to be paying off. Coffman told the ambassadors that Lockheed Martin has generated more than \$17 billion of incremental shareholder wealth since 1992.

## Staying vital in a new environment

Sheryl says she thinks Sandia can learn from the way Lockheed Martin responded to the challenge of staying vital in a market of decreasing defense expenditures.

"We're facing a similar thing," she says. "Funding for the Labs is flat. Maybe things aren't declining too much right now, but they're certainly not increasing in our core nuclear weapons mission. The same was true for Lockheed Martin's core defense contracts."

"Lockheed Martin is constantly on the lookout for new arenas where they can win. We need to do more of that."

"The other thing I think we can learn from is Lockheed Martin's divestiture focus. They divest regularly, on a weekly basis, things that aren't profitable or maybe are profitable but don't fit with what they're doing. Pete Teets talked about Martin Marietta's old gravel pit business, which Lockheed Martin has sold off. Even though they were profitable, the gravel pits didn't fit with the corporation's focus."

"As Pete said, 'It's a long way from crushed rock to rockets.' At some point you have to divest things that no longer make sense to be involved in, and I don't think we do that at Sandia effectively enough."

# The end of an era: Sandia's 17-meter Vertical Axis Wind Turbine comes down after two decades

**VAWTs not successful in the marketplace, but still a good design, say wind energy researchers**

By John German

It went up two decades ago with the optimism and determination of a nation seeking greener, more reliable ways of meeting its growing energy needs. It came down this week with a sense of nostalgia, and, yes, some disappointment.

For two decades Sandia's eggbeater-shaped 17-meter Vertical Axis Wind Turbine (VAWT) just inside the Eubank Gate was a distinctive frontispiece of the Labs' renewable energy programs, as well as a symbol of Sandia's propensity for adapting to the nation's ever-evolving definition of national security.

Constructed in 1976 and 1977 during a period of heightened national concern about the continued availability of world energy sources, the VAWT was an experimental new rendering of an old idea — the windmill. (The 17-meter VAWT was actually Sandia's third vertical axis wind turbine. A 5-meter VAWT operated for a short time in 1974 on top of Bldg. 802; a 2-meter version was used in wind tunnel tests in the mid 70s.)

By using the rotational energy of thousands of windmills to produce electricity, scientists and policymakers thought, cities could literally be powered by the wind, particularly in blustery regions such as the United States' coastal areas, mountain passes, and great plains.

## A market happenstance

In the rush to diversify the nation's energy-production portfolio following the energy crisis of 1973, several competing wind turbine designs cropped up, along with photovoltaic, solar, hydroelectric, and other renewable energy technologies. Among wind turbines, the VAWT was a distinctive and technically competitive standout.

The VAWT's vertical airfoils captured wind energy from any direction at any time. The power-generation equipment was at ground level for easy maintenance. The VAWT design was easily adaptable to modern direct-drive generators. And VAWT blades could be manufactured more economically than the propeller-like airfoils used on their upright cousins.

Eventually, says Henry Dodd, Manager of Wind Energy Technology Dept. 6214, companies that invested in VAWT designs (primarily US companies) fell victim to a poor US wind energy market and were unable to compete overseas. European companies that had focused on more conventional looking two- or three-bladed upright designs fared better. The last remaining com-

pany building VAWTs filed for bankruptcy in recent months.

But the dominance of propeller-type turbines was more of a market happenstance than a case of engineering superiority, he says.

"Technically the vertical design was an excellent concept," he says. "It offered good aerodynamic performance, good structural dynamics, and good manufacturability. And it still is a good concept."

The good news, he says, is that wind energy production is taking off internationally, particularly in Europe, as wind-generated electricity becomes an increasingly viable alternative to fossil-fuel energy production.

Last year, more than 10 terawatt hours of

wind-generated electricity was produced worldwide, enough to meet the residential needs of Copenhagen, Amsterdam, Dublin, and Zurich combined. Cumulative world generating capacity from wind turbines topped 6,000 megawatts last year and is expected to reach 10,000 megawatts by 2000. Denmark will soon be getting about 20 percent of its electricity from wind turbines.

For the past five years, wind has been the fastest growing renewable energy source worldwide.

## Safety concerns led to dismantlement

Although Albuquerque isn't the windiest location for a working wind turbine, Sandia/New Mexico's 17-meter VAWT whirred and whistled its way through 12 years of testing as

Labs researchers strove to optimize its design and eke out its maximum energy-production potential, testing a variety of blade configurations, materials, and generator technologies.

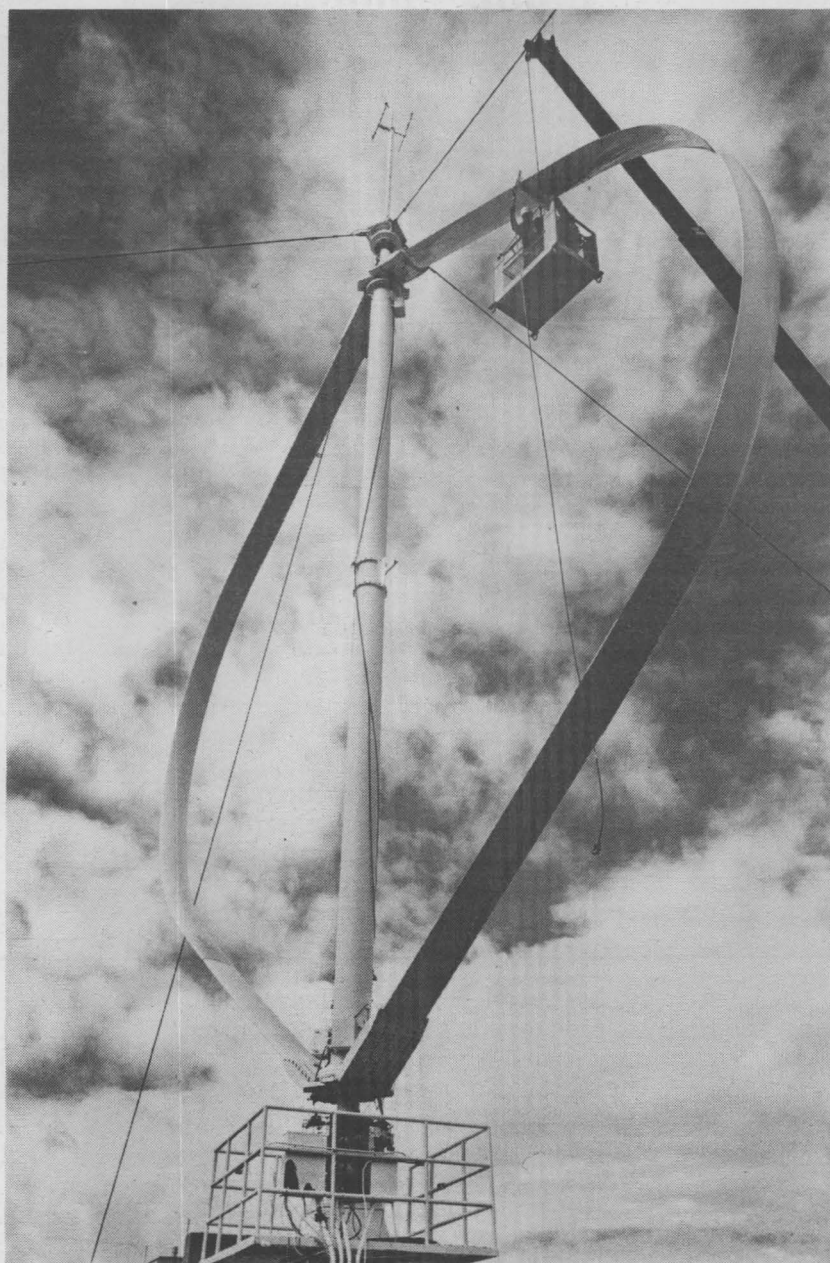
But the VAWT hadn't been used in about nine years prior to its dismantlement this week. The people in Wind Energy Technology Department had been monitoring cracks in its concrete tie-down anchors and stand foundation for several years. The cracks continually grew in number and size until the department felt it had no choice but to dismantle it, says Mark Rumsey (6214).

Great care was taken to preserve the VAWT's structural integrity during its dismantlement in case it needs to be reconstructed later, Mark says. The Smithsonian Institution already has expressed some interest in the VAWT as a museum display.

Meanwhile, says Henry, Sandia's wind energy program continues. Dept. 6214 is partnering with the National Renewable Energy Laboratory (NREL) in Golden, Colo., and with NREL's National Wind Technology Center near Boulder, Colo., on improving wind turbine performance and structural integrity.

Sandia has the lead role in this partnership in materials, manufacturing, fatigue, and reliability issues. The Dept. 6214 staff is also working with Sandia researchers at the Airworthiness Assurance Nondestructive Inspection Validation Center near the Albuquerque airport to develop inspection techniques and other diagnostic tools that will help find and identify flaws in wind turbine blades as well as monitor the structural health of aging wind turbines.

In addition, the technology developed at Sandia in unsteady aerodynamics, atmospheric turbulence simulation, fatigue analysis, and testing applies to wind turbines of any axial orientation, adds Henry.



WITH THE HELP of two large cranes, workers from Henderson Construction of Albuquerque prepare to dismantle the 17-meter Vertical Axis Wind Turbine just inside the Eubank gate to Kirtland Air Force Base. On Tuesday workers removed the VAWT's blades. The central torque tube was to be gently lowered to the ground later in the week. (Photo by Randy Montoya)

## Feedback

**Q:** I've learned that KAFB will let Sandia employees continue to use the base gym. They don't have to join the Officers Club. But what about retirees? Why aren't we allowed to use the gym?

**A:** Kirtland Air Force Base has carefully reviewed a new set of federal regulations governing the use of military facilities. Initially, interpretation of these regulations suggested that these facilities, including the base gym, would be available only to military personnel and a few nonmilitary individuals such as security personnel who are subject to mandatory fitness programs.

Recently, however, the Base Commander has indicated that some flexibility exists in interpreting these regulations. Accordingly, active employ-

ees continue to be able to access these facilities. Unfortunately, some groups remain excluded from use of these facilities, including retirees from Sandia and DOE.

There has been substantial work on the part of all of the Sandia community to maintain access to these facilities. While there has been significant success in these efforts, it is accurate that retirees along with certain other groups are no longer able to access the base gym. Should there be an alteration of KAFB's implementation of these Air Force regulations, publication of this information will certainly be provided.

— Larry Clevenger, MD (3300)

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**Q:** When will the online telephone directory be updated to reflect employees' new IJS titles?

**A:** The technical staff, laboratory staff, and technologist levels are not available in the Sandia

Directory by design. Before programming decisions were made (prior to April 1997), the IJS Design Team polled its respective divisions. A decision was made to have "ladder," not "level," show in the Sandia Directory. The main reason for this was to de-emphasize potential "classism." Managers told us that emphasis on "ladder" would help promote a more inclusive work environment and would encourage teaming.

You may note that the directory displays levels for some non-IJS classifications (e.g., ASAs and represented employees). We are working with HRIS and the owners of the online directory to display their information without levels as well. For instance, an ASA-C would display as ASA. You will still be able to determine the secretary of an organization.

Further enhancements to the online directory, such as drop-down boxes for the "title," will begin development in January. — Don Blanton (3500)



## Celebrating success: Secretaries hold their own three-day conference

Hundreds of Sandia secretaries, and several guest secretaries from Lawrence Livermore and Los Alamos national laboratories, gathered at the Wyndham Garden Hotel in Albuquerque Nov. 3, 4, and 5 for the Annual Sandia Secretarial Conference.

The Secretarial Quality Process Council (SQPC) conference team, consisting of team coordinator Anita St. Onge (2), Ruth Lucero (1252), Marylu Wilson (1128), and Denise Blaisdell (4512), planned and coordinated the conference.

"It was a lot of hard work, but well worth the effort after receiving such positive feedback from so many appreciative secretaries," says Denise.

Secretaries were welcomed on Monday by Joan Woodard, VP of Energy, Environment, and Information Technology Div. 6000; Tuesday by Don Carson, Director of Public Relations and Communications Center 12600; and Wednesday by John Crawford, Labs Executive VP and Deputy Director.

### Celebrating one another's successes

Kathy Komoll, VP of Real Estate and Community Affairs at Furr's Supermarkets, provided an eye-opening, down-to-earth presentation on climbing the corporate ladder.

"For me, one of the best moments was when Kathy said, 'The image of the catty woman has to go,'" says Jane Elson, Executive Assistant to Labs President and Director C. Paul Robinson. "I wanted to stand up and applaud. We need to support each other and celebrate one another's successes."

Keynote speaker Rod Stewart, a local motivational lecturer, stressed being victors, not victims, of change during his presentation about obstacles to creativity and keys to survival.

Former secretarial supervisor Carol Kaemper (ret.) and current secretarial supervisor Sue Henderson (12111) gave a fast-paced and humorous update on the evolution of technology during their combined 41 years of service.

"It was wonderful and the highlight of the whole conference," says Jane. "Sue and Carol never rehearsed and were so spontaneous, exhibiting such easy rapport."

Madeline Griggs and Margaret Davis (both 5134) of Sandia's Washington office gave the secretaries an introduction to the Washington office in Arlington, Va.

Redd Eakin of Community Involvement & Issues Management Dept. 12650 showed slides taken at the President's Summit for America's Future on Community Outreach, which she attended as an Albuquerque delegate in Philadelphia.

"I was very moved by Redd's presentation. She feels so passionate about these issues, and she motivates people to get involved," says Christine Chavez (12600), SQPC chair.

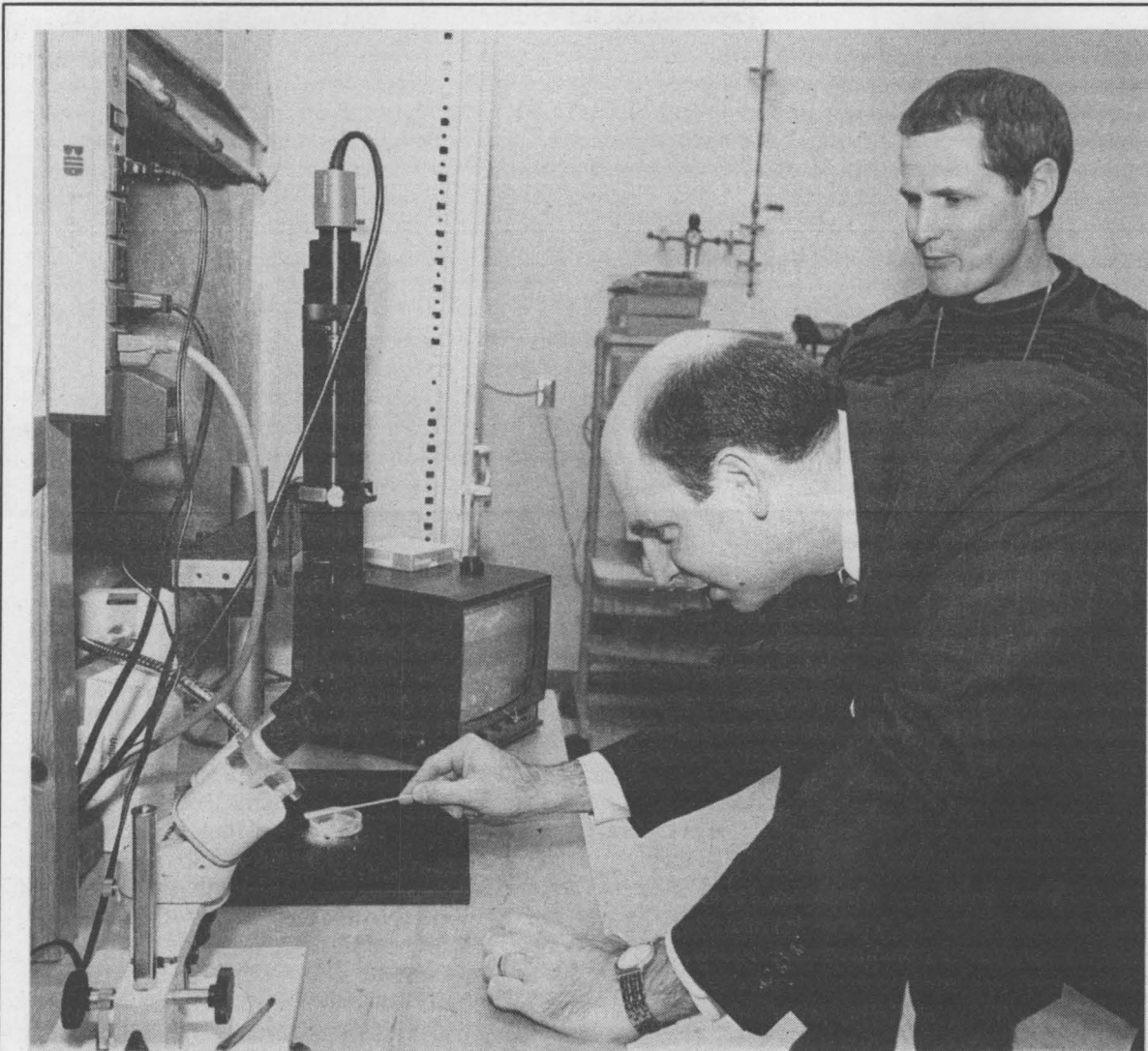
A fashion show coordinated by Soila Brewer (3526) with clothes modeled by Sandia secretaries demonstrated how to "Dress for Success." Break-out sessions provided tips on personal safety, estate and tax planning, holiday crafts (a sellout performance by Mike McClafferty, 14403), Tai Chi, and Auto Quik Tips (by Phil Rivera, 7899). Rochelle Lari (3512) showed how to effectively update and input résumés into Résumé Builder.

Gary Shepherd (4911) closed the seminar with a presentation titled, "And now for the news....," a humorous depiction of how Sandia secretaries are conforming to the many new changes being implemented at the Laboratories.

Christine summed up the event: "I think the conference was a smashing success. We learned that with the innovation of the electronic age, secretaries will effectively meet these challenges and benefit from the opportunities these challenges will present." — Nancy Campanozzi

## ★ Congratulations

To Jeanette and Howard (9234) Walther, a son, Alexander, Oct. 28.



GOODYEAR Manager for Engineering Administration and Support Steve Portalupi moves a tray of "microparts," each about the diameter of a human hair, around under a microscope as Rush Robinett of Intelligent System Sensors and Controls Dept. 9611 helps him find the tiny components on the screen to their right in a lab at Sandia's Robotic and Intelligent Manufacturing Science and Engineering Laboratory. Portalupi was among a dozen Goodyear executives who visited Sandia Nov. 4 and 5 to discuss Sandia's work with Goodyear under a series of cooperative research and development agreements. (Photo by Randy Montoya)

## MOU with Semiconductor Research Corp. gives Labs greater access to research results

Labs Executive VP John Crawford traded signatures recently with Semiconductor Research Corporation (SRC) President Larry Sumney on an agreement that gives Sandia greater access to research carried out under the consortium's auspices.

The two leaders signed the memorandum of understanding Oct. 29 in San Jose, Calif., during the Semiconductor Industry Association's (SIA) annual meeting there.

Supported by US integrated circuit manufacturers, the SRC is the research arm of the SIA. Its primary charter is to conduct research that will help IC manufacturers fabricate higher performance integrated circuits. It also supports university programs that train students to work in the US computer chip industry.

The agreement gives the Labs access to the SRC's research database and allows Sandia representatives to participate in future SRC research review and planning meetings. Other plans call for wider interactions and for establishing a Sandia-supported graduate student intern program at the Microelectronics Development Laboratory (MDL).

"This agreement will allow our researchers to be conversant in the latest semiconductor industry-university research trends and technical issues, and to interact with university personnel and researchers from SRC member companies on a regular basis," says Bob Blewer, Manager of Industry and University Partnerships Dept. 1305.

In addition, he says, Sandia will be able to draw from SRC's rich collection of research results, and Labs research will be presented at SRC meetings and results published in the research database. That should create opportunities for Sandia to interact with companies and universities interested in Labs work.

The graduate student internship program seeks to bring top students from across the country to work with the advanced manufacturing equipment at the MDL's full-flow fabrication facility. The first collection of student interns could arrive at Sandia as early as this summer for semester- or year-long internships.

"They'd get training in state-of-the-art equipment, which many of them don't have access to at their universities, and we'd get the benefit of their research techniques, enthusiasm, and new ideas," says Harry Weaver, Manager of Microelectronics Technologies Dept. 1321. "And when they go to work in industry we'd have ready points of contact."

The initial focus of the agreement will be on modeling and simulation, already part of a cooperative research and development agreement (CRADA) between SRC and DOE; Sandia and Los Alamos National Laboratory are participating in that CRADA to develop computer modeling and simulation technologies to tackle a wide range of semiconductor processing and performance problems.

Bob Eagan, VP of Physical Sciences and Components Div. 1000; Tom Hunter, VP of California Laboratory Div. 8000; and Al Romig, Director of Microelectronics and Photonics Center 1300, also attended the signing. —John German

## ★ Recent Patents

LeRoy Whinnery (8230), Monte Nichols (8715), David Wheeler (1812), and Douglas Loy (1815): Process for Preparing Silicon Carbide Foam.

Dora Derzon (1811), Charles Arnold Jr., and Frank Delnick: Thin Film Polymeric Gel Electrolytes.

John Klem and John Zolper (both 1314): Semiconductor Tunnel Junction with Enhancement Layer.

Samuel Miller (1325), William Miller (1276), and Paul McWhorter (1302): Information Encoder/Decoder Using Chaotic Systems.

# Mileposts

November 1997



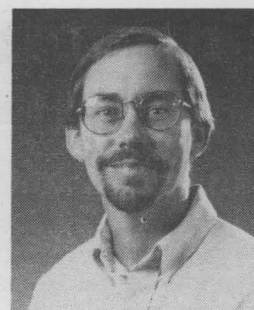
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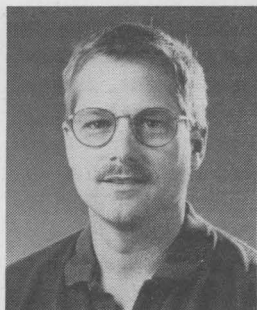
Kathleen McCaughey  
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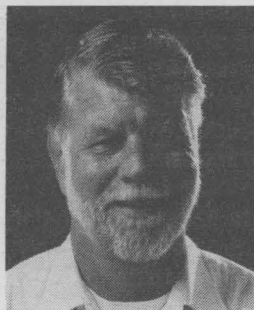
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Richard Howe  
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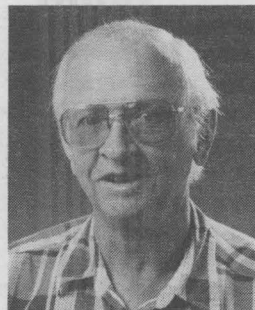
Mark Platzbecker  
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David Baldwin  
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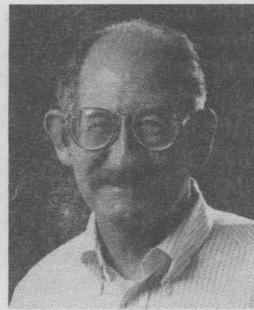
Mark Garrett  
15 9742



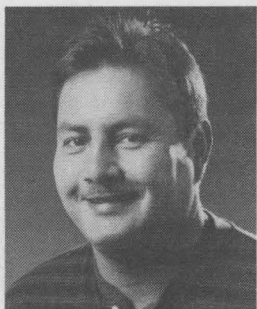
Wayne McMurtry  
20 6342



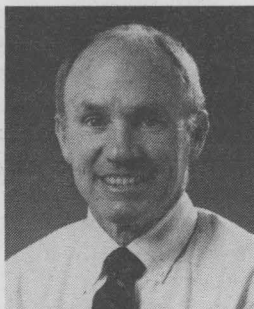
Richard Anderson  
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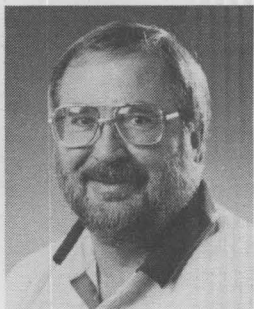
Milo Harcourt  
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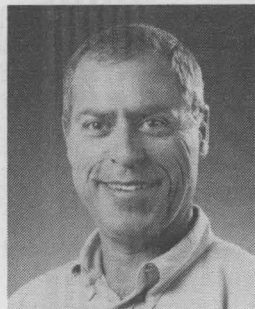
David Schroeder  
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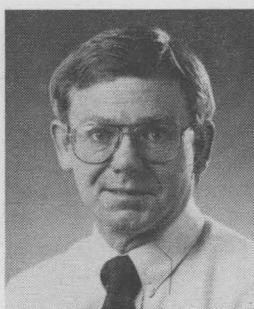
Arthur Mansure  
15 6111



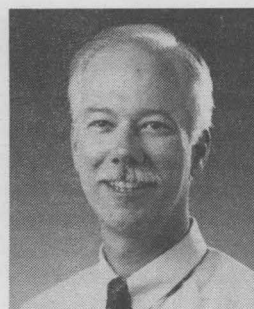
Raymond Hibray  
25 1314



Forrest James  
30 1481



Robert Setchell  
25 1152



Rodney May  
20 9706

## Sandia News Briefs

### UNM dedicates Center for High Technology Materials

The University of New Mexico has officially dedicated its new Center for High Technology Materials (CHTM) at University Center Research Park, 1313 Goddard SE, in Albuquerque. US Senators Pete Domenici and Jeff Bingaman joined UNM officials and representatives from Sandia, Los Alamos National Laboratory, and Phillips Laboratory to dedicate the 59,645-square-foot facility. The \$14 million CHTM focuses on research in optoelectronics, lasers, and microelectronics manufacturing, technologies that are vital in the telecommunications and computer industries. The Center has 24 research and teaching laboratories; a 5,365-square-foot clean room; offices for faculty, postdoctoral researchers, and students; a computer laboratory; classrooms; and a library. Research that was previously conducted in the UNM Electrical Engineering Building has been relocated to the new facility. The CHTM is one of the state's five Centers for Technical Excellence created by the state legislature in 1983 to strengthen ties between UNM, private industries, and the federal laboratories and to advance economic development in the state.

### Arvizu, Martinez win awards for their accomplishments, commitment

Dan Arvizu, Director of Materials and Process Sciences Center 1800, and Consuelo Martinez of Supplier Relationships Dept. 10801 are recipients of major awards from organizations that promote business and professional opportunities for minorities. Dan has been selected as one of 12 recipients in the annual Hispanic Alliance for Career Enhancement (HACE) "Salute to Excellence" award. He was recognized by the organization in a Nov. 14 ceremony in Chicago. HACE is a recognized leader in developing initiatives for Hispanic participation in managerial, decision-making, and professional positions, and for advancing educational opportunities for college students. Consuelo has earned the Rio Grande Minority Purchasing Council's "Volunteer of the Year" award for FY97. The Purchasing Council promotes opportunities for small minority and women-owned businesses in New Mexico.

### PV researchers Post and Thomas win kudos from BLM

Hal Post and Mike Thomas, both of Photovoltaic Systems and Applications Dept. 6218, have been honored by the US Bureau of Land Management for their role in supporting a number of successful photovoltaic projects for the BLM. Under a Sandia-BLM partnership, appropriate, cost-effective photovoltaic projects on BLM lands were identified and partially funded through a grant from the Labs. Hal and Mike were leaders in helping BLM implement 80 new photovoltaic projects, including small remote monitoring stations, comfort station lighting, portable campground host systems, water pumping for campgrounds, field stations, and facility power for ranger stations, visitor centers, and a museum. In the citation from BLM, Hal and Mike were praised for their "knowledge, energy, and enthusiasm" and were recognized as "a tremendous driving force in promoting photovoltaic use within BLM." Hal and Mike's efforts, said the citation, have helped introduce three million BLM visitors a year to renewable energy technologies.

### Bingaman-backed initiative to create intelligent-machine industry moves forward

Sandia's efforts to help establish a national initiative to create a new intelligent machines industry has gotten a big boost with the formal endorsement of Sen. Jeff Bingaman's eight-point national action plan by the Senate-House Bipartisan Task Forces on Manufacturing.

Bingaman's plan, outlined in a keynote address to the Congressional Expo on Robotics and Intelligent Machines on Sept. 30, would enable the United States to seize new opportunities created by advances in robotics and intelligent machines.

In a Nov. 5 letter, the joint Senate-House Task Forces on Manufacturing urged representatives from DOE, the Department of Defense, Department of Commerce, NASA, and the National Science Foundation to develop a roadmap for carrying out the national initiative. They are asked to report back to Congress on their progress by the time the President introduces the 1999 budget.

Bingaman's plan recommends that DOE and NASA establish three testbed centers for robotics — at Sandia, Carnegie Mellon University, and the Jet Propulsion Laboratory — that would be open to other federal agencies and private-sector researchers. The centers would provide prototyping capabilities for potential users, serve as a meeting ground for researchers from different disciplines, develop and disseminate generic software for robots, and establish training courses for young professionals.

## Fun & Games

**Skiing** — The Kirtland Officers Wives Club Ski Club is opening several ski trips to nonmembers:

**Wolf Creek Weekend, Dec. 5-7:** Bus loads from the east parking lot of the Officers Open Mess at 5:30 p.m. on Dec. 5 and returns around 10:30 p.m. on Dec. 7. Cost includes bus fare, two nights' lodging at Best Western Oak Ridge Lodge in Pagosa Springs and two days' lift tickets; a \$2 per person guest fee for nonmembers will be added. Cost for adults and children over 12, \$152; seniors (65 and over) and children under 12, \$135; nonskiers, \$95. Contact Mary at 899-3073 or Glenda at 858-0682.

**Angel Fire Weekend, Jan. 9-11:** New high-speed quad lift. Bus loads from the east parking lot of the Officers Open Mess at 5:30 p.m. on Jan. 9 and returns around 9:30 p.m. on Jan. 11. Cost includes bus fare, lodging at Snowfire Condos, and two days' lift tickets; \$2 fee added for nonmembers. Cost for adults and children over 12, \$168; seniors (65 and over), \$108, ski free; children under 12, \$144 (per person); nonskiers, \$108. Contact Jane at 856-1860 or Karen at 856-1927.

**Summit County, Colo., Keystone, Vail, Breckenridge, and other choices, Feb. 7-11:** A drive-yourself or carpool trip. Lodging prices (private condo) range from \$66 to \$126 for four nights; \$2 per person guest fee for nonmembers. Lift prices depend on where you want to ski and will be acquired at a discount. Contact Mary Feiler at 899-3073 or Margrit Aunapu at 856-2206.

**Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads**

**MISCELLANEOUS**

REFRIGERATOR, Kenmore, 19.2-cu. ft. frostless freezer, \$200; running board for minivan (DEEZEE brand), \$20. Loubriel, 268-1341.

LABRADOR PUPS, whelped 9/20, champion bloodlines, dew claws, first shots, black, 2 females, \$300/ea., 1 male, \$275. Ortiz, 286-2007, ask for David or Martha.

HEALTHRIDER EXERCISE MACHINE, \$275. Sheldahl, 299-4077.

MEDICINE CABINET, large, wooden, for bathroom, good shape, approx. 3' x 3', \$30. Cassidy, 924-2154.

ARTIFICIAL CHRISTMAS TREE, 7-1/2-ft. tall, \$40; baby stroller, \$40. Walkup, 275-7986.

WOMAN'S NORDICA 727 SKI BOOTS, size 8-1/2, \$30; mouse/hamster plastic cage, w/extras, food, bedding, \$20. McRee, 898-5165.

LUMINARIAS, \$4/doz., \$11/3 doz., delivered before Christmas, Boy Scout Troop 395. Quinlan, 296-1852.

SIBERIAN HUSKY, 2-yr.-old, male, free to good home. Butcher, 286-3530.

BIKE RACK, Rhode Gear, holds 2 bikes, trunk-mounted, adjustable, fits almost any car, \$15. Finger, 266-8906.

SANDBOX, covered (large green plastic turtle), & sand, \$25; 2 pair drapes, for 3 x 6 window, \$10 ea. Hudson, 884-7621.

CRIB BY BASSETT, w/mattress, \$100; high chair, Kolcraft adjustable, \$25; bassinet, \$20. Antonich, 271-1635.

GRAY TABBIE, female, "Dusty," 7 yrs. old, spayed, declawed, shots, free to good home. Kwak, 232-2512.

SATELLITE DISHES/CONTROLLER BOXES, conventional (2), free if you dismantle & haul away. Jones, 771-8020.

SEGA GENESIS, w/5 games, 16-bit, w/controller and small color TV, great gift, \$70. Kottenstette, 797-4011.

TWIN-SIZE BED, mattress & box spring only, good condition, \$50. Creel, 294-1650.

DEC COMPUTER, complete PRO 350 computer, w/LA50 printer, TSX/RT11 & P/OS software & documentation, \$150. Azevedo, 898-7700.

SOFA & MATCHING LOVESEAT, big blue recliner (like new), \$700; 2 TVs: 19-in. & 25-in., c/r TVs, best offer. Newell, 246-9660.

HOLIDAY ARTS & CRAFTS FAIR, Georgia O'Keeffe Elem. School, Sat., Nov. 22, 9 a.m.-4 p.m., 11701 San Victorio Ave NE (off Spain or Academy, between Juan Tabo & Tramway). Ekman, 296-3758.

TWO TOURING BIKES (one with Shimano brakes), \$75 ea.; 3-wheel lapidary grinder, w/polishing wheel, \$150. Baldo-Pulaski, 345-0432.

EXERCISE BIKE, Sears Air Gometer, w/health monitor, \$40; B Plotter, camper shell. Strother, 281-5699.

GUITARS: Epiphone Sheraton & Emperor, gold trim & hard cases; small amp & '64 Acoustic. Carson, 858-1460.

DRYWALL BOARDS, 20 sheets, 1/2" x 4' x 12', you haul, \$4.50 ea. Garavaglia, 821-2286.

BLACK REFRIGERATOR, Kenmore, less than 1 yr. old, 21-cu. ft., top freezer, \$500; man's small sheepskin jacket, \$50. Daigneau, 293-5077.

BROTHER KNITTING MACHINE, KH-840, w/stand, knitleader, ribber, color changer, instruction & pattern books, extras, \$500. Trever, 294-7364.

TWIN CAPTAIN'S BED, solid oak, three under drawers, very firm mattress, great for boys. Keener, 298-0892.

AXLES, 3,500-lb., 2 complete, w/hubs, tires & wheels, U-bolts included, \$300/both. Trussell, 323-2894, ask for Danny.

SALE, research-quality electronic equipment/parts (thousands), transistors, diodes, oscilloscopes, clothes, small appliances, 4401 Lead SE, Nov. 29, 8 a.m.-? Maddox, 298-3815.

SOFA SECTIONAL, looks unused, must see, contemporary design, mauve & blue on cream background, 9' x 9', \$600 OBO. Schneider, 296-0869.

JEWELRY & GEM SHOW, perfect gifts for the holidays, Nov. 29, 10 a.m.-6 p.m. & Nov. 30, 12-5 p.m., UNM Cont. Ed. Bldg. (1634 University Blvd NE). Ruffner, 275-5764.

CREAM COUCH, w/bolsters, like new; waterbed, complete, king-size. Griffin, 294-5702.

NORDICA 127 SKI BOOTS, 2 pair, boy's size 5, \$20 ea; Wayne Gretzky's 3D Hockey game, for Nintendo 64, \$30. Anderson, 897-2772.

FREEZER, 20-cu. ft., Kenmore, upright, w/locking door, \$250. Martinez, 828-9634.

TRUCK TOOL STORAGE, \$50 OBO; ladder, 12-ft. extension, \$90 OBO. Carrillo, 296-7461.

AKITA PUPS, 2 beautiful, affectionate males, parents are champions, free of hip dysplasia. Kanipe, 281-4255.

ELECTRONIC TYPEWRITER, Royal Alpha 2001, auto erase, portable w/carrying case, excellent condition, extra ribbon cartridges, \$25. Koenig, 294-2264.

BROWN BEER BOTTLES, 12 oz., 8 cases, cleaned, requiring crown caps, total 192 bottles, beer maker's special, \$25. Brion, 298-1761.

LITTLE TIKES DOLLHOUSE, \$15; toddler car seat, \$30; booster chair, \$10; fine-quality walnut end tables (2), \$100. Sullivan, 298-4880.

BEANIE BABIES, Garcia, Chops, Spooky, Seamore, Doodle, Velvet, Legs, Hoot, Chocolate, Blizzard, great gifts. Meyers, 243-3342.

TABLE SAW, 10-in., Sears, w/roll-around stand, variety of blades, extra large work area. Spray, 884-8453.

ALTO SAXOPHONE, student "VITO" sax, gold w/silver keys, new pads, complete w/mouthpiece, unused reeds, black case, \$250. Aguilar, 238-0567.

CRAFT FAIR, Sat., Nov. 22, 9 a.m.-4 p.m., Sun., Nov. 23, 8 a.m.-1 p.m., Holy Ghost school, 900 block, San Pedro SE. Rivera, 892-3236.

DIGITAL TELEPHONE ANSWERING MACHINES, Model 7550, Code-A-Phone, \$25 ea., best on the market. Chavez, 842-6374, after 6 p.m.

WESLO CARADIOGLIDE, virtually new, used only few minutes, w/electronic meter, \$85. Lohr, 821-1043.

CHIPPER/SHREDDER, Craftsman, 5-hp, like new, \$295. Aragon, 888-3473.

14.4 ZOOM FAX/MODEM, user's manual, \$25. Mounho, 299-0883.

ANTIQUE ROCKERS, hand-crafted coffee table, shop & yard items, holiday gifts, toys, TVs, linens, clothing. Burch, 857-0654.

COLOR TV, 9-in., AC/DC; artificial Christmas tree, 6-ft., nice, \$18; 2 sleeping bags, \$7.50 ea. Sublett, 884-4426.

PELLA WOOD FOLDING DOOR, walnut, like new, 5-ft. 10-in. wide, fits 8-ft. high opening, cost \$300, asking \$100. Biffle, 293-0330.

FIVE DAYTON WIRE WHEELS, 13x7, white hub & spokes, w/new tires, adapters & knockoffs, \$1,500 OBO. Martinez, 830-3501.

GOVERNMENT SAFES, 2 & 4 drawer, \$150 ea., new down-filled ski jacket, man's medium, \$150. Larsen, 292-7301.

SIMMONS HIDE-A-BED, like new, \$300; Fiberlite wind deflector, perfect condition, \$60. Parrish, 299-2043.

PENDULUM CLOCK KIT, 3-ft., \$35; heavy-duty jon boat, 8-ft., \$50; bed-side chamber, \$50; portable gallon sprayer, \$10; beautiful chandelier, \$35. Westman, 881-0471.

SOFA SLEEPER, dark blue, 2 off-white rockers, w/ottoman, matching area rug, \$600 for all. Garduno, 237-1648.

GE APPLIANCES: dishwasher, white, \$200; 27-in. drop-in electric range, \$50; side-by-side refrigerator, w/ice-maker, \$250; SS sink, \$25. Booker, 299-3554.

FIREPLACE TOOL SET, antique brass, like new, matching cradle, matches, starter logs, wood tote bag, \$50. Reyes, 275-4908.

STUDENT POTTERY SALE, Fri.-Sat., Nov. 21-22, 10 a.m.-6 p.m., Coyote Craft School, 1525 Edith NE; throwing & Raku firing demos all day. Howard, 839-9203.

FRANCISCAN WARE, harvest gold, service for 6, all serving pieces, pitcher, gravy boat, etc., will sell separately. Caskey, 298-6428.

SOFA/HIDE-A-BED, 6 ft.; queen futon, w/mattress; trumpet w/case; cornet w/case; \$150 ea.; lateral file, \$50. Crow, 821-0956.

BAR STOOLS, 3 wrought-iron, leather seats, excellent condition, \$30 ea. or \$75 all three. Hessel, 296-9124.

WHITE-WASH CRIB, w/mattress, excellent condition, \$300 new, asking \$125. Martinez, 881-0695.

**DEADLINE: Friday noon before week of publication unless changed by holiday. MAIL to Dept. 12640, MS 0165, FAX to 844-0645, or bring to Bldg. 811 lobby. You may also send ads by e-mail to Nancy Campanozzi (nrcampa@sandia.gov). Call Nancy at 844-7522 with questions. Because of space constraints, ads will be printed on a first-come basis.**

- Ad Rules**
1. Limit 18 words, including last name and home phone (We will edit longer ads).
  2. Include organization and full name with the ad submission.
  3. No phone-ins.
  4. Use 8 1/2- by 11-inch paper.
  5. Type or print ad; use accepted abbreviations.
  6. One ad per issue.
  7. We will not run the same ad more than twice.
  8. No "for rent" ads except for employees on temporary assignment.
  9. No commercial ads.
  10. For active and retired Sandians and DOE employees.
  11. Housing listed for sale is available without regard to race, creed, color, or national origin.
  12. "Work Wanted" ads limited to student-aged children of employees.

WOODEN DOOR, 36-in., solid core, exterior stained, excellent condition, \$60; Accordia blind, 69"W x 86"L; double doors, \$100. Malcomb, 294-6975.

WOODSTOVE, Orley's energy-saver wood stove, good condition, w/hardware to connect to fireplace, \$250. Nickerson, 298-5634.

DOT-MATRIX PRINTER PAPER, 1 box (about 2,000 sheets, 20 lbs.), 8-1/2" x 11", white paper. \$10. Diprima, 275-3479.

THOMAS ORGAN, double keyboard, beautiful, \$240; Gem DSK-7 digital full personal keyboard, \$400; perfect for holidays. Jordan, 293-4117.

DINING/KITCHEN table, 6-ft., glass top, 4 chairs, best offer. Matlack, 256-7371.

DEACON'S BENCH, \$65; rowing machine, \$70; cradle, \$45; doll cradle, \$15. Levan, 293-0079.

RIFLE, Remington 788, .243 Win., w/4x scope, excellent condition, excellent holiday gift, \$275. Savage, 890-4796.

WOMAN'S MOTORCYCLE JACKET, small (size 10), \$100; cross-country skis (195), poles; Casio keyboard, Model CT670 Tonebank, mid-capable, \$400 OBO. Mills, 262-0554.

STERLING SILVERWARE, 56-pieces, 8 place settings, Manchester, Gadronette pattern, \$1,000 OBO. Daniel, 260-0461.

**TRANSPORTATION**

'92 PONTIAC GRAND PRIX, 3.4L V6, AT, new tires, white, loaded, 61K miles, excellent condition, \$8,500. Wilcoxon, 296-8295.

'91 PLYMOUTH VOYAGER LE, all-wheel drive, all power, AT, 3.3L V6, 1 owner, excellent condition, \$1,100 below book, \$7,750. Guillinger, 299-6680.

'92 TOYOTA PICKUP, extended cab, 5-sp., AC, cruise, AM/FM cassette, 67K miles, great shape, \$8,900 OBO. Konkel, 866-0304.

'84 TOYOTA TRUCK, 4x4, AC, 4-cyl., 5-sp., lined shell, carpeted bed insert, 184K miles, \$3,500. Sweeney, 255-6787.

'95 HONDA ACCORD EX, 2-dr. coupe, 5-sp., fully loaded, 49,600 miles, used as commuter, \$14,500 firm. Perez, 843-6032, ask for Mike.

'92 CHEV. CAMARO RS, V8, T-top, 66K miles, CD, new tires, AC, cruise, tilt, beautiful, clean, sporty, \$9,900 OBO. Castillo, 294-0766.

'87 CHEV. PICKUP R10, 1/2-ton, short-bed, V8 305C10, 75K miles, AC, AT, shell, AM/FM cassette, \$6,000. Gonzales, 823-9511.

'95 LEXUS ES-300, white, w/tan leather, excellent condition, moonroof, CD changer, security system, low mileage. Kirby, 821-3938.

'89 FORD THUNDERBIRD LX, full pkg., Titanium, 82K miles, nice clean car, well maintained. Willis, 821-0854.

'90 RED ISUZU TROOPER, 4WD, standard, AC, V6, great condition, \$7,600 OBO. Carroll, 839-9030, evenings or leave message.

'93 CHEV. CORSICA LT, excellent condition, V6, AT, AC, ABS, air bag, low 46K miles, \$5,700. St. John, 256-1841, ask for Matt.

'85 F150, 92K miles, 6-cyl., 4WD, 4-sp., shell/short bed, premium wheels, good rubber, manuals, \$3,400. Krivitzky, 897-9104, evenings.

'83 OLDS DELTA 88, V8, AC, good condition, 4-dr., \$1,200 OBO. Padilla, 831-9257.

'93 SATURN SL, 4-dr., 5-sp., new tires, excellent condition, at base car lot, \$6,500 OBO. Whitlow, 321-2597.

'88 GRAND AM, runs well, decent high school car, \$1,600. Carr, 281-1632.

'93 FORD EXPLORER XLT, 4x4, extended warranty, low mileage, excellent condition, 1 owner, \$13,900 OBO. Bullock, 286-1910.

'91 SAAB 9000CD, 4-dr., AT, power, leather, sunroof, excellent condition, regular maintenance, low mileage, \$8,195 OBO. Kraft, 797-9700.

'89 FORD TEMPO, low miles, AC, 5-sp., 4-dr., well maintained, \$1,850. Otts, 839-1268, leave message.

'72 VW SUPER BEETLE, rebuilt 1600 engine, new paint, good interior, runs very well, \$1,800 OBO. Lesperance, 281-4921.

'86 NISSAN PICKUP, 4x4, \$3,600; 17-ft. open bow boat, w/Mercruiser, 140-hp I/O, \$2,900; trade one or both for Blazer-type vehicle. Lenberg, 266-8988.

'94 FORD EXPLORER, Eddie Bauer, 4x4, fully loaded, excellent condition, 50K miles, extended warranty, book value \$18,174, asking \$16,500. Bragg, 275-3172.

'89 FORD TAURUS, white, 3.0L V6, AC, PS, AT, cruise, tilt, 52K miles, excellent condition, \$4,000. Sivinski, 296-0301.

'89 CHEV. PICKUP, 1/2-ton long bed, 5.7L V8, AT, 3.73 rear end, 5th wheel hitch, brake control, tool box, \$7,900 OBO. Johnson, 867-9239.

'86 RED HONDA PRELUDE SI, excellent condition, 114K miles, \$4,300. Hickman, 268-4762.

'83 PORSCHE 928, champagne gold/burgundy, sunroof, leather, stereo, PW, PS, strong AC, good condition, \$7,000. Dudley, 255-3626.

'85 TOYOTA 4-RUNNER, 5-sp., 4-cyl., AC, JVC stereo, chrome wheels, towing pkg., white, no accidents/dents, 169K miles, \$6,500 OBO. Newman, 266-6928.

'96 TOYOTA CAMRY, 31K miles, AT, PB, PS, cruise, 4-cyl., \$16,700. Hunter, 864-2210.

'83 CADILLAC DEVILLE, 4-dr., 102K miles, maintenance records available, excellent interior & exterior, \$2,300. Keiss, 299-3312.

'90 HONDA ACCORD DX, charcoal gray, 5-sp., 75K original miles, excellent condition, \$6,300 OBO. Otero, 836-4215.

'86 TOYOTA CELICA GTS, 103K miles, 5-sp., power everything, 1 owner, \$2,750 OBO. Henderson, 858-1321.

'96 FORD WINDSTAR GL, AC, cruise, 22K miles, under warranty, excellent condition, \$16,000. Clark, 890-8108.

**RECREATIONAL**

SOUTHWEST AIRLINES ROUND-TRIP VOUCHERS, anywhere Southwest flies, 2 at \$275 ea., one expires 3/98, other 6/98. Baca, 299-4875.

'83 SUZUKI XN85 TURBO, very rare, well maintained, 14K miles, \$2,500 firm. Romero, 867-6444.

DIAMONDBACK GIRL'S MOUNTAIN BIKE, toe-clips, grip-shift, water bottle, U-lock, ridden twice, approx. 25 original miles, \$250. Wilson, 884-8913.

LAWRENCE WELK ESCONDIDO CALIFORNIA RESORT, 2-bdrs., furnished, Dec. 6-13, golf course on-site, 30 miles from San Diego, my cost at \$400. Stang, 256-7793.

SNOWBOARD, 96 Lamar Circle, "L" 154, w/bindings, dark-green top, w/yellow base, used 1 season, \$350. Hine, 280-1297.

'96 JAYCO POP-UP TRAILER, sleeps 6, beautiful Southwestern-style decor, \$3,999 OBO. Malecki, 294-3668.

'94 MOUNTAIN BIKE, Diamond Back "Sorrento," 19-in., 21-sp., w/shock clips, bar ends, good condition, \$250 OBO. Donald, 332-1446, ask for Justin.

IDLE-TIME CAB-OVER CAMPER, fully contained, sleeps 5, flushable toilet, oven/stove, heater, 8-ft. full-size bed, great condition, \$900. Eldred, 865-1406.

OMNISOFIT DOWNHILL SKIES, 185cm w/Solomon bindings, \$40; Barcrafter roof rack, \$15. Dobranich, 298-4547.

**REAL ESTATE**

3-BDR. HOME, 1-3/4 baths, double garage, pretty, near Spain/Juan Tabo, 5508 Zambra NE, \$125,000. Giles, 296-8543.

3-BDR. CUSTOM HOME, north Albuquerque acres, 2,300 sq. ft., spectacular city/mountain views, 1 acre, below appraisal. Arnold, 821-1630.

4-BDR. HOME, 2,800 sq. ft., 1/3 acre, far NE, 2-3/4 baths, 2 kiva FPs, jacuzzi, shop, shed, exposed beams, portal, balcony, immaculate, flyers at credit unions. Hillman, 275-3896.

2-BDR. TOWNHOUSE, 1,795 sq. ft., near I-40 & UNM, west of Carlisle on Indian School, plenty of southern exposure, \$137,500. Kubiak, 856-7455.

4-BDR. HOME, remodeled kitchen, bathrooms, dining, 2 living areas, mega storage, views, elementary adjacent, 11609 Bellamah, open Nov. 22-23, 1-4 p.m. Atkins, 298-5762.

4-BDR. HOME, 2-1/2 baths, 2-story, 2,477+ sq. ft., immaculate, 3-years new, NE Heights, \$244,900. Fitzgerald, 275-0521.

2-BDR. HOME, 1 acre, large fenced yard, easy freeway access, Edgewood, \$75,000. Cupp, 281-3434.

**WANTED**

SINGER FEATHERWEIGHT SEWING MACHINE, with case. Carpenter, 256-0614.

LITTLE TIKES OUTDOOR GYM SET W/SLIDE, ages 2-5; rocking horse. Phelan, 869-6094.

MEAT GRINDER, any size, electric preferred but manual will do, if price is right. Cocain, 281-2282.

HOUSEMATE, to share 3 bdr./2-bath home, NE Heights, \$325/mo + 1/3 utilities, must like dogs. Manginell, 296-7961.

FLUTE, for beginning student. Wong, 856-1050.

HOUSE OR APARTMENT TO RENT, Jan.-May '98, for visiting biology professor at UNM, contact Dr. Peter Stacey, 262-2320, or pstacey@unm.edu. Jansma, 294-3524.

FILM EDITOR, 8mm, desire motorized unit. Hayes, 299-1200.

SKI RACKS, for '93 Grand Cherokee Laredo. Carli, 298-9271.

HOUSEMATE, large home near Candelaria/Tramway, \$500/month including utilities. Widler, 294-4263.

SOLAR COLLECTORS. Monnet, 865-7941.

'68-'71 CORVETTE, prefer big block, w/4-sp., but will consider all. Kureczko, 281-8206.

HOUSEMATE, to share 4-bdr. home, 2 baths, near Menaul/Juan Tabo. Plummer, 299-5299, after 6 p.m.

**WORK WANTED**

HOUSESITTING, responsible family seeking 6-month housesitting position. Vogel, 275-0774.

HOUSESITTING, looking for rental house w/land & quiet, for mom & child, will gladly care for animals. Field, 268-4914.

HOUSESITTING, responsible individual, w/client references. Ortiz, 292-5589.

**LOST & FOUND**

LOST: One pierced earring, black stone on gold loop. Glass, 845-8050, ask for Jill.

## Change in LTD+ premium rates

Effective Jan. 1, Long-Term Disability Plus (LTD+) premium deduction rates will increase. The new rates will be \$0.18/\$100 for the 10 percent buy-up option and \$0.37/\$100 for the 20 percent buy-up option. The increased rates will begin being deducted from current participants' paychecks on Jan. 8.

This increase is due to the fact that DOE will not allow Sandia to offer the Long-Term Disability Plus (LTD+) Plan unless there is no cost involved; the plan must be totally employee paid. Statistics drawn from claims history and the benefits currently being paid out show that a premium increase is required to adhere to DOE's regulation and keep a much-requested plan for our employees. The LTD+ rates will be re-evaluated once a year. Because they are directly correlated with claims and plan usage, rates may decrease or increase in the future.

Current LTD+ Participants may choose to continue coverage under the LTD+ Plan, and their rates will automatically be changed on Jan. 1, or

they may choose to discontinue participation in the plan. (Note: If you, as a current LTD+ participant, choose to discontinue participation at this time and would like to re-enroll at a later date, you will be subject to proof of insurability and approval by the third party administrator in charge of the contract. In addition, you are not eligible to receive LTD+ benefits until you have been reinstated and have paid premiums for 12 consecutive months from the date of reinstatement.)

If you are not participating in the LTD+ Plan and are interested in signing up for an additional 10 percent or 20 percent of your income in the event that you become totally and permanently disabled and are approved for LTD basic (Sandia-paid disability coverage), contact Karen Roybal (3343) at 844-4938 or Suzanne Moya (also 3343) at 844-5588 for a Proof of Insurability form. If you are a new employee, you have 31 days from your six-month anniversary date to enroll in the LTD+ Plan without proof of insurability by contacting the Benefits office.

## Coronado Club

Nov. 20 — Thursday bingo night. Card sales and buffet start at 5 p.m., early birds' bingo at 6:45 p.m.

Nov. 21 — Dining and dancing. Buffet served 6-9 p.m. Music by Midnight Magic, 7-11 p.m.

Nov. 25 — Thanksgiving luncheon, \$4.95. Lunchline open 11 a.m. to 2 p.m.

Nov. 27 — Thanksgiving Day dinner buffet. 11 a.m. and 1 p.m. seatings. Reservations required (265-6791).

Dec. 4, 11 — Thursday bingo night. Card sales and buffet start at 5 p.m., early birds' bingo at 6:45 p.m.

Tickets now available at C-Club for gala New Year's Eve party.

## Project managers invited to special briefing by CFO Frank Figueroa

Chief Financial Officer Frank Figueroa will deliver a special briefing for project managers on Monday, Dec. 8, from 9 to 11 a.m., in the Center for National Security and Arms Control (CNSAC, Bldg. 810) auditorium (Rm. C117).

Frank will provide information about Sandia's budget, business model, and infrastructure costs. There will be a question-and-answer period to discuss any other financial issues of interest to attendees.

As the primary contact with external customers, project managers critically need accurate and timely financial information. It is the CFO's objective to increase communication about business information between line organizations and Business Management and CFO Div. 10000.

If you have any questions that you would like to submit in advance, send them directly to Linda Worden (10000) via e-mail at laworde@sandia.gov.

## Automated Gate 1 opens Monday

Gate 1, at the south end of Bldg. 800, reopens Monday (Nov. 24) as a fully automated vehicle gate. It will provide Tech Area 1 access for authorized vehicles only; pedestrians, bicycles, and other traffic must use other gates. The gate will be operational 6 a.m. to 6 p.m. Monday through Friday.

The gate will be dedicated with a ribbon-cutting ceremony the week of Dec. 8.

## Favorite Old Photo



WWII CADET DAYS — This is my training group at Primary Flight School at Ryan Field just outside of Tucson on Feb. 2, 1944. We flew the Ryan PT-22 behind us. Our instructor (Mr. Brower) was a civilian pilot, the gentleman standing at left was a lieutenant who came from the US Army, and the rest of us were regular aviation cadets. That's me, kneeling down at your left. I ended up flying the famous old C47, which you may know as the DC3, to places like Iwo Jima and Okinawa. — Bob Leslie (12364)

## Deadlines for summer 1998 intern hires

If you wish to hire a student for summer 1998, the time to start planning is now. Tactical Staffing Requisitions (TSR) for new hires must be placed with your staffing specialist by no later than Jan. 31 to ensure a May-June 1998 start date. If decisions have already been made in your organization, the TSR can be placed at any time prior to Jan. 31 — even now. An early summer start date cannot be ensured for TSRs received after Jan. 31.

If you communicate with students interested in summer 1998 employment consideration, please advise them that a résumé and official transcripts must be received in Staffing Dept. 3535, MS 1023, as follows:

For local students attending high school and post-secondary institutions in Albuquerque and the surrounding area (including New Mexico State University and the University of Texas-El Paso), deadline for receipt of résumé and current transcripts is Jan. 31. In California, Stanford, UC-Davis, Berkeley, and California State-Hayward are considered part of the local market.

For all other student applicants, the deadline for receipt of résumé and current transcripts is Nov. 30.

If you have questions regarding a new student hire, contact the staffing specialist for your division. If you have questions regarding a returning student, call Rebecca Romero (3535) at 844-8458.

## Feedback

### Bad news and good: Current purchase requisition system is flawed, but new electronic system will streamline process

*Q: I walked a purchase requisition through on Sept. 26. The PR contained a list of 26 specialized tools for electronic assembly. Rather than writing the list by hand, I put it in an Excel format that provided all required information. I made the additional effort to wait to talk to the buyer to inform him that I could e-mail the file to him to expedite the purchasing process. He told me that an Excel file was of no use. I offered to provide a Word file and met with the same response. He indicated some displeasure at the length of the list and said that he would have to give it to a clerk to retype. For a similar order approximately one month ago, Purchasing used the same process with the result that we received an incorrect part due to a typo on the part of Purchasing. I spent considerable time developing the required tool list, walked the PR through the system, offered my support, and the result was that I encountered a bad attitude, was not treated like a customer, and will have to live with the extra time, cost, and potential for error for a manual-input step that should not exist. Rather than give you the specific PR number and the buyer's name, I believe it will be more productive to address this issue on a more global basis. Some buyers understand how to deal with their customers. My interest is not in getting a specific buyer in trouble. Perhaps if this Feedback is*

*provided by management in a more sanitized form or the buyers are provided with better electronic tools, the issue will go away. I would appreciate your feedback.*

*A: We agree that the current system is not well designed to handle importing line-item data on to the purchase requisition. There is a way to do it, but it's so cumbersome that most Sandia contracting representatives retype the entire list. That's the bad news. The good news is that Procurement is implementing an electronic purchasing requisition (EPR) that will eliminate the need to manually re-key data the requester has already entered into the system. You also mentioned re-keying errors. We estimate that the new system will yield an 80 percent reduction in common PR errors such as those you cited. We also recognize that too many people are expending valuable time walking PRs through the system. The new EPR will eliminate the need to do a walk-through to expedite your purchase. Approvals will be done online and in parallel where appropriate. The new EPR system should be up in February 1998. Once it's online, please let us know if you have any suggestions for improvement.*

—Dave Palmer (10200)